DOCUMENT RESUME

ED 219 648 CE 033 505

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TITLE	Chain Saw Repair.
INSTITUTION	Mid-America Vocational Curriculum Consortium, Stillwater, Okla.
PUB DATE	78
NOTE	116p.; For a related document see ED 146 392.
AVAILABLE FROM	Mid-America Vocational Curriculum Consortium, 1515 West Sixth Avenue, Stillwater, OK 74074.
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Behavioral Objectives; Competency Based Education; Criterion Referenced Tests; *Engines; Equipment; Hand Tools; *Learning Activities; Postsecondary Education; *Repair; Technical Occupations; Transparencies; *Units of Study; Vocational Education
IDENTIFIERS	*Chain Saws; *Small Engine Repair

ABSTRACT

This curriculum is designed to supplement the Comprehensive Small Engine Repair guide by covering in detail all aspects of chain saw repair. The publication contains materials for both teacher and student and is written in terms of student performance using measurable objectives. The course includes six units. Each unit contains some or all of the basic components of a unit of instruction: performance objectives, suggested activities for teacher and students, information sheets, assignment sheets, job sheets, transparency masters, tests, and answers to the tests. Units are liberally illustrated and are planned for more than one lesson or class period of instruction. Information for the teacher includes an instructional/task analysis of chain saw repair, and a list of tools needed. Topics covered by the six units are the following: chains, chain sharpening, chain link replacement, bars, chain oilers, and chain saw drives. (KC)

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ED219648

CHAIN SAW REPAIR

by
Mark Taylor
and
Wayne Helbling

Developed by the
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Printed by

State Department of Vocational and Technical Education
Stillwater, Oklahoma 74074

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FOREWORD

The Mid-America Vocational Curriculum Consortium (MAVCC) was organized for the purpose of developing instructional material for the twelve member states. Priorities for developing MAVCC material are determined annually based on the needs as identified by all member states. One of the first priorities identified was comprehensive small engine repair. This publication is a part of a project designed to provide the needed instructional material for small engine repair programs.

The success of this publication is due, in large part, to the capabilities of the personnel who worked with its development. The technical writers have numerous years of industry as well as teaching experience. Assisting them in their efforts were representatives of each of the member states who brought with them technical expertise and the experience related to the classroom and to the trade. To assure that the materials would parallel the industry environment and be accepted as a transportable basic teaching tool, organizations and industry representatives were involved in the developmental phases of the manual. Appreciation is extended to them for their valuable contributions to the manual.

This publication is designed to assist teachers in improving instruction. As these publications are used, it is hoped that the student performance will improve and that students will be better able to assume a role in their chosen occupation, small engine repair.

Instructional materials in this publication are written in terms of student performance using measurable objectives. This is an innovative approach to teaching that accents and augments the teaching/learning process. Criterion referenced evaluation instruments are provided for uniform measurement of student progress. In addition to evaluating recall information, teachers are encouraged to evaluate the other areas including process and product as indicated at the end of each instructional unit.

It is the sincere belief of the MAVCC personnel and all those members who served on the committees that this publication will allow the students to become better prepared and more effective members of the work force.

Bob Perry, Chairman
Board of Directors
Mid-America Vocational
Curriculum Consortium

PREFACE

For many years those responsible for teaching small engine repair have felt a need for instructional materials to use in this area. A team of teachers, industry representatives, and trade and industrial education staff members accepted this challenge and have produced manuals which will meet the needs of many types of courses where students are expected to become proficient in the area of small engine repair. The MAVCC *Chain Saw Repair* publication is designed to supplement the MAVCC *Comprehensive Small Engine Repair* publication by covering in detail all aspects of chain saw repair not included in general engine repair or the repair of other small engines.

Every effort has been made to make this publication basic, readable, and by all means usable. Three vital parts of instruction have been intentionally omitted from this publication: motivation, personalization, and localization. These areas are left to the individual instructors and the instructors should capitalize on them. Only then will this publication really become a vital part of the teaching-learning process.

In addition, we would appreciate your help. We check for content quality, spelling, and typographical errors many times in the development of a manual. It is still possible, however, for an error to show up in a publication.

If, in the use of this publication, you should find something questionable we would appreciate you bringing it to our attention. A copy of the page or pages in question with your suggestions for correction would certainly help use when we revise and update materials.

We're trying to provide you with the best possible curriculum materials and will certainly appreciate your help in detecting areas where possible corrections are needed to maintain the quality you want and deserve.

Ann Benson
Executive Director
Mid-America Vocational Curriculum
Consortium, Inc.

ACKNOWLEDGMENTS

Appreciation is extended to those individuals who contributed their time and talents to the development of *Chain Saw Repair*.

The contents of this publication were planned and reviewed by:

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Gratitude is expressed to Regina Decker for editing and to Teddi Cox and the Graphics Division of the Oklahoma State Department of Vocational and Technical Education for typing. Special appreciation goes to Jeanne Stewart for the illustrations and drawings used in this publication.

The printing staff of the Oklahoma State Department of Vocational and Technical Education is deserving of much credit for printing this publication.

USE OF THIS PUBLICATION

Instructional Units

The *Chain Saw Repair* curriculum includes nine units. Each instructional unit includes some or all of the basic components of a unit of instruction: performance objectives, suggested activities for teacher and students, information sheets, assignment sheets, job sheets, visual aids, tests, and answers to the test. Units are planned for more than one lesson or class period of instruction.

Careful study of each instructional unit by the teacher will help to determine:

A. The amount of material that can be covered in each class period.
B. The skills which must be demonstrated.
   1. Supplies needed
   2. Equipment needed
   3. Amount of practice needed
   4. Amount of class time needed for demonstrations
C. Supplementary materials such as pamphlets or filmstrips that must be ordered.
D. Resource people that must be contacted.

Objectives

Each unit of instruction is based on performance objectives. These objectives state the goals of the course thus providing a sense of direction and accomplishment for the student.

Performance objectives are stated in two forms: unit objectives, stating the subject matter to be covered in a unit of instruction and specific objectives, stating the student performance necessary to reach the unit objective.

Since the objectives of the unit provide direction for the teaching-learning process, it is important for the teacher and students to have a common understanding of the intent of the objectives. A limited number of performance terms have been used in the objectives for this curriculum to assist in promoting the effectiveness of the communication among all individuals using the materials.

Following is a list of performance terms and their synonyms which may have been used in this material:

Name	Identify	Describe
Label	Select	Define
List in writing	Mark	Discuss in writing
List orally	Point out	Discuss orally
Letter	Pick out	Interpret
Record	Choose	Tell how
Repeat	Locate	Tell what
Give		Explain

Order	Distinguish	Construct
Arrange	Discriminate	Draw
Sequence		Make
List in order		Build
Classify		Design
Divide		Formulate
Isolate		Reproduce
Sort		Transcribe
		Reduce
		Increase
		Figure

Demonstrate	Additional Terms Used	
Show your work	Evaluate	Prepare
Show procedure	Complete	Make
Perform an experiment	Analyze	Read
Perform the steps	Calculate	Tell
Operate	Estimate	Teach
Remove	Plan	Converse
Replace	Observe	Lead
Turn off/on	Compare	State
(Dis) assemble	Determine	Write
(Dis) connect	Perform	

Reading of the objectives by the student should be followed by a class discussion to answer any questions concerning performance requirements for each instruction unit.

Teachers should feel free to add objectives which will fit the material to the needs of the students and community. When teachers add objectives, they should remember to supply the needed information, assignment and/or job sheets, and critierion tests.

Suggested Activities

Each unit of instruction has a suggested activities sheet outlining steps to follow in accomplishing specific objectives. The activities are listed according to whether they are the responsibility of the instructor or the student.

Instructor: Duties of the instructor will vary according to the particular unit; however, for best use of the material they should include the following: provide students with objective sheet, information sheet, assignment sheets, and job sheets; preview filmstrips, make transparencies, and arrange for resource materials and people; discuss unit and specific objectives and information sheet; give test. Teachers are encouraged to use any additional instructional activities and teaching methods to aid students in accomplishing the objectives.

Students : Student activities are listed which will help the student to achieve the objectives for the unit.

Information Sheets

Information sheets provide content essential for meeting the cognitive (knowledge) objectives of the unit. The teacher will find that information sheets serve as an excellent guide for presenting the background knowledge necessary to develop the skills specified in the unit objective.

Students should read the information sheets before the information is discussed in class. Students may take additional notes on the information sheets.

Transparency Masters

Transparency masters provide information in a special way. The students may see as well as hear the material being presented, thus reinforcing the learning process. Transparencies may present new information or they may reinforce information presented in the information sheets. They are particularly effective when identification is necessary.

Transparencies should be made and placed in the notebook where they will be immediately available for use. Transparencies direct the class's attention to the topic of discussion. They should be left on the screen only when topics shown are under discussion.

Job Sheets

Job Sheets are an important segment of each unit. The instructor should be able to and in most situations should demonstrate the skills outlined in the job sheets. Procedures outlined in the job sheets give direction to the skill being taught and allow both student and teacher to check student progress toward the accomplishment of the skill. Job sheets provide a ready outline for students to follow if they have missed a demonstration. Job sheets also furnish potential employers with a picture of the skills being taught and the performances which might reasonably be expected from a person who has had this training.

Assignment Sheets

Assignment sheets give direction to study and furnish practice for paper and pencil activities to develop the knowledges which are necessary prerequisites to skill development. These may be given to the student for completion in class or used for homework assignments. Answer sheets are provided which may be used by the student and/or teacher for checking student progress.

Test and Evaluation

Paper-pencil and performance tests have been constructed to measure student achievement of each objective listed in the unit of instruction. Individual test items may be pulled out and used as a short test to determine student achievement of a particular objective. This kind of testing may be used as a daily quiz and will help the teacher spot difficulties being encountered by students in their efforts to accomplish the unit objective. Test items for objectives added by the teacher should be constructed and added to the test.

Test Answers

Test Answers are provided for each unit. These may be used by the teacher and/or student for checking student achievement of the objectives.

CHAIN SAW REPAIR
INSTRUCTIONAL/TASK ANALYSIS

JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)	RELATED INFORMATION: What the Worker Should Know (Cognitive)
	UNIT I: CHAINS
	1. Terms
	2. Parts of a chain
	3. Cutter parts
	4. Cutter types
	5. Causes of chain failure
6. Calculate chain pitch	
	UNIT II: CHAIN SHARPENING
	1. Terms
	2. Methods of sharpening chains
	3. Reasons for keeping chains sharp
4. Hand sharpen a chain	
5. Gauge a chain	
6. Adjust chain tension	
	UNIT III: CHAIN LINK REPLACEMENT
	1. Terms
	2. Safety factors
	3. Tools used in link replacement
4. Remove and replace a chain link	

JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)	RELATED INFORMATION: What the Worker Should Know (Cognitive)
	UNIT IV: BARS
	1. Terms
	2. Types of bars
	3. Parts of a bar assembly
	4. Causes of bar damage
5. Repair a solid nose bar	
	UNIT V: CHAIN OILERS
	1. Terms
	2. Categories of oilers
	3. Types of automatic oilers
	4. Operation of automatic oilers
5. Check a chain oiler for proper operation	
	UNIT VI: CHAIN SAW DRIVES
	1. Terms
	2. Types of drives
	3. Types of drive sprockets
	4. Parts of a gear reduction assembly
	5. Parts of a direct drive assembly
6. Remove, inspect, service, and replace a direct drive assembly	

TOOLS

Hand Tool Assortment

- One pound ball peen hammer
- Slip joint pliers
- Screwdrivers
  - 4" standard and phillips
  - 1 1/2" standard and phillips
  - 8" standard and phillips
- Adjustable wrench
- 3/8" socket set with reversible ratchet
- 1/4" socket set with reversible ratchet
- Cold chisel
- Combination wrench set 7/16 to 7/8
- Open end wrench set - metric
- Metric socket set
- Safety glasses

Other Tools and Equipment

- Assortment of round chain files and handles
  - 1/8"
  - 5 mm
  - 3/16"
  - 7/32"
  - 1/4"
  - 9/32"
  - 5/16"
- Leather gloves
- Bar vise
- File card
- Chain breaker
- Rivet spinner
- Combination wrench set - metric
- Drain pan
- Hex key set
- Inside micrometer set
- Outside micrometer set
- Impact screwdriver set
- Heli-coil kit
- Snap ring pliers
- Bench vise
- Surface plate
- Feeler gauge set
- Machinist's steel rule
- 3/8" drive phillips screwdriver socket set
- No bounce hammer
- Tape measure
- Parts pan
- Cleaning brush
- Parts washing pan
- Pin wrench
- Soft drift
- Bushing driver set
- Test lamp
- Ohmmeter
- Spark plug wrench
- 0-1" telescoping gauge

CHAINS
UNIT I

UNIT OBJECTIVE

After completion of this unit, the student should be able to identify the main parts of a chain. The student should also be able to identify four types of cutters and calculate chain pitch. This knowledge will be evidenced through demonstration and by scoring eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with chains to the correct definitions.
2. Identify the main parts of a chain.
3. Identify four types of cutters.
4. Identify the main parts of a cutter.
5. List causes of chain failure.
6. Calculate chain pitch.

CHAINS
UNIT I

SUGGESTED ACTIVITIES

I. Instructor:

A. Provide student with objective sheet.

B. Provide student with information sheet.

C. Make transparencies.

D. Discuss unit and specific objectives.

E. Discuss information sheet.

F. Provide student with examples of damaged chains and have the student identify the causes of failure.

G. Give test.

II. Student:

A. Read objective sheet.

B. Study information sheet.

C. Participate in class discussions.

D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

A. Objective sheet

B. Information sheet

C. Transparency masters

1. TM 1--Main Parts of a Chain
2. TM 2--Types of Cutters
3. TM 3--Main Parts of a Cutter

D. Assignment Sheet #1--Calculate Chain Pitch

E. Test

F. Answers to test

II. Reference--*Chain Saw Service Manual.* Kansas City: Technical Publications Division/Intertec Publishing Corporation, 1974.

CHAINS
UNIT I

INFORMATION SHEET

I. Terms and definitions

A. Chain--Cutting assembly on a chain saw

B. Drive link--Chain component which has a tang that meshes with the drive clutch teeth to drive the chain around the bar

C. Guard link--Chain component on semi and micro chisels used instead of the tie strap

D. Preset cutter--Chain component which has a cutting edge and rivets to attach all other components of the chain

E. Preset tie strap--Chain component which connects the drive links and cutters and has rivets to attach other components

F. Rivet--Contains a flange and hubs to fasten the chain components together

G. Bar--Flat, oblong metal part with grooves which provide a race for the chain drive link to follow

H. Roller nose--Bar end piece with a center pivot designed to reduce chain friction by rotating with the chain as it rolls over the end of the bar

I. Chain pitch--Half the distance between the centers of the cutter toe end rivet hole and the next tie strap toe end rivet hole

II. Main parts of a chain (Transparency 1)

A. Drive link

B. Tie strap (side link)

(NOTE: On some chains the guard link replaces the tie strap.)

C. Preset cutter, left hand and right hand

D. Preset tie strap (side link)

E. Rivet

INFORMATION SHEET

III. Types of cutters (Transparency 2)

(NOTE: These are basic configurations. Many versions are presented by various manufacturers.)

A. Chipper

B. Chisel

C. Semi and micro chisel

D. Power sharp

IV. Main parts of a cutter (Transparency 3)

A. Top plate

B. Gullet

C. Depth gauge

D. Rivet hole

E. Toe

F. Heel

G. Side plate

V. Causes of chain failure

A. Chain improperly adjusted

B. Worn or damaged bar groove

C. Lack of lubrication

D. Improper filing or sharpening

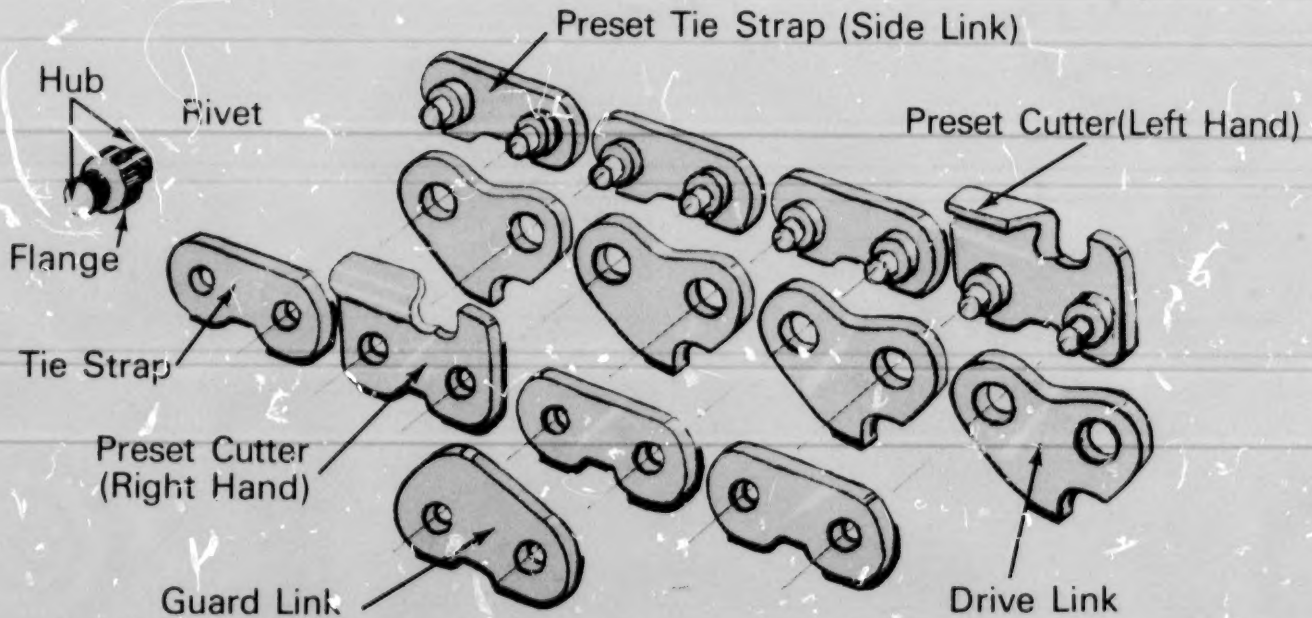
E. Abrasion

F. Worn out roller nose

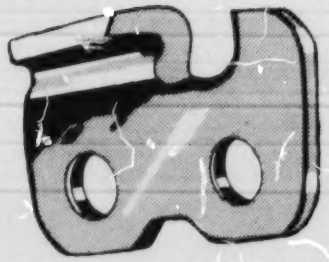
G. Improper use

H. Damaged sprocket teeth

Main Parts of A Chain

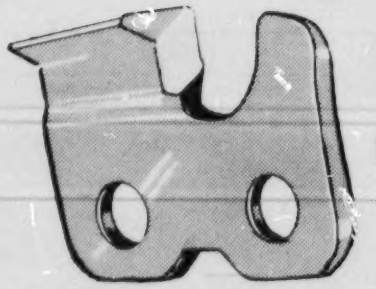


Types of Cutters



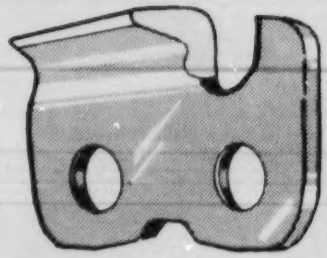
Chipper

Round Side Plate on Cutter



Chisel

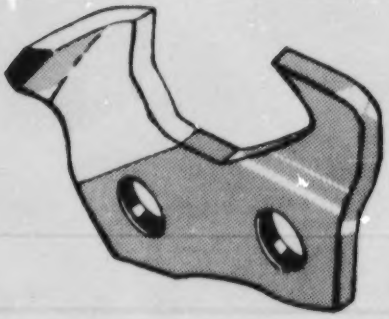
Square Corner at Top and Side Plate Intersection



Semi and Micro Chisel

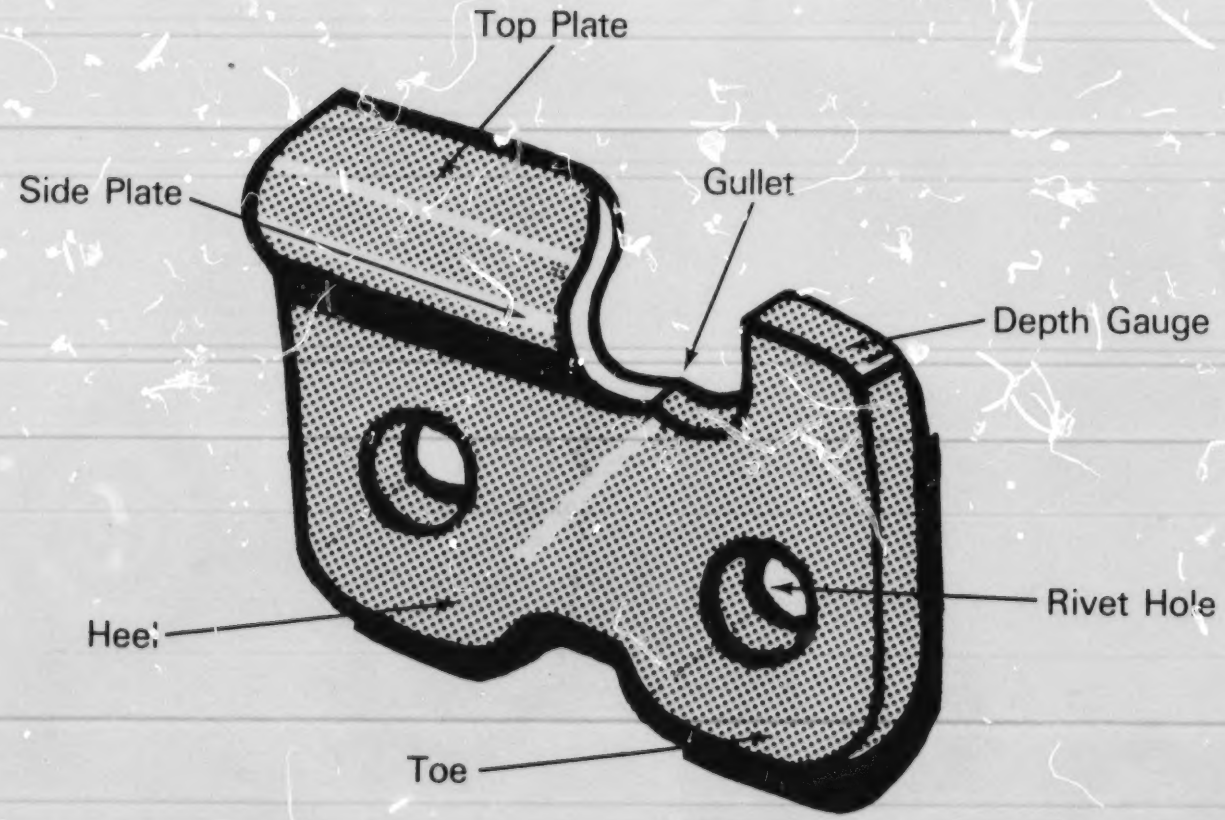
Round Corner at Top and Side Plate Intersection

Flat Side Plate



Power Sharp

Main Parts of A Cutter

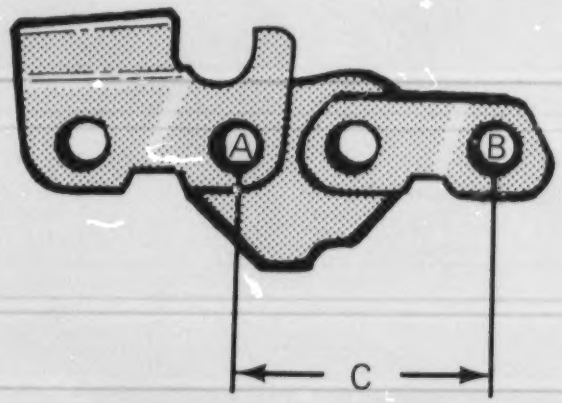


CHAINS
UNIT I

ASSIGNMENT SHEET #1--CALCULATE CHAIN PITCH

Directions: Using the dimensions listed below, calculate the chain pitch. Chain pitch is equal to the distance (labeled "C" in Figure 1) between the center of a cutter toe end rivet hole (labeled "A" in Figure 1) and the next tie strap toe end rivet hole center ("B") divided by two.

Figure 1



Example: C = 3/4"
Work: Chain pitch = $3/4 \div \frac{2}{1} = 3/4 \times 1/2 = 3/8$

Chain pitch = 3/8"

Problems:

a. C = 7/8"

CP = _____

b. C = 1"

CP = _____

c. C = 1 1/8"

CP = _____

d. C = 1 1/2"

CP = _____

e. C = 1/4"

CP = _____

CHAINS
UNIT I

ANSWERS TO ASSIGNMENT SHEET

a. 7/16"

b. 1/2"

c. 9/16"

d. 3/4"

e. 1/8"

CHAINS
UNIT I

NAME _____

TEST

1. Match the terms on the right to the correct definitions.

_____a. Contains a flange and hubs to fasten the chain components together

_____b. Chain component which connects the drive links and cutters and has rivets to attach other components

_____c. Chain component which has a cutting edge and rivets to attach all other components of the chain

_____d. Chain component on semi and micro chisels used instead of the tie strap

_____e. Chain component which has a tang that meshes with the drive clutch teeth to drive the chain around the bar

_____f. Flat, oblong metal part with grooves which provide a race for the chain drive link to follow

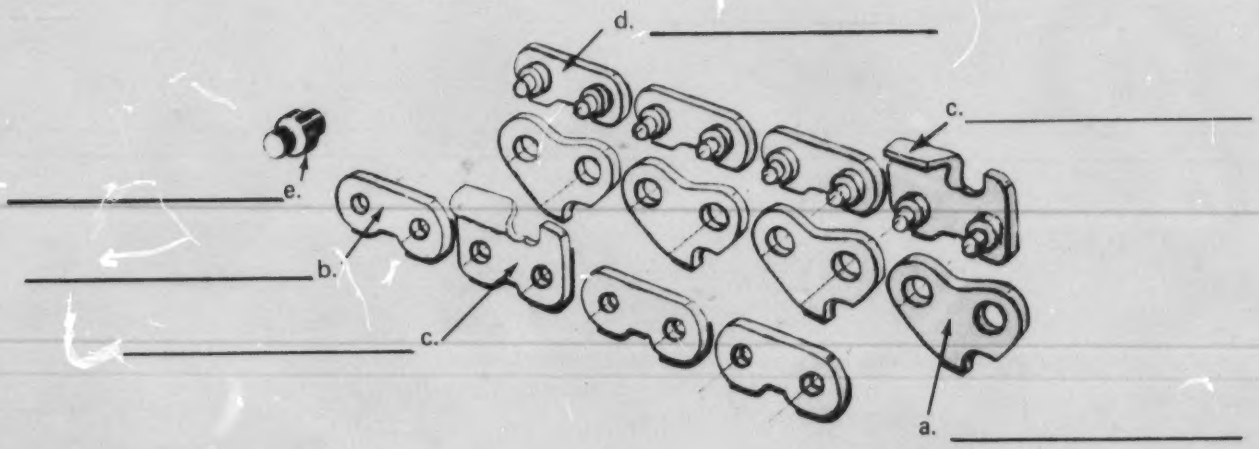
_____g. Cutting assembly on a chain saw

_____h. Bar end piece with a center pivot designed to reduce chain friction by rotating with the chain as it rolls over the end of the bar

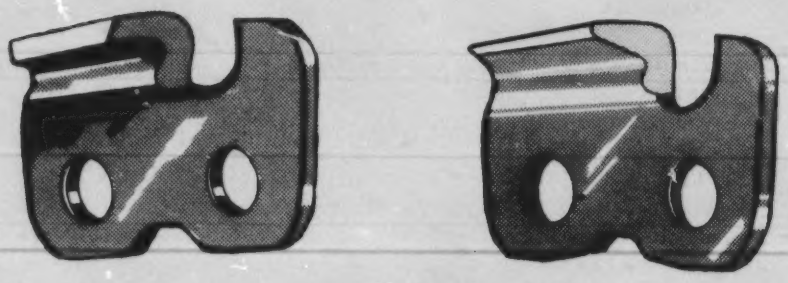
_____i. Half the distance between the centers of the cutter toe end rivet hole and the next tie strap toe end rivet hole

1. Drive link
2. Guard link
3. Preset tie strap
4. Rivet
5. Preset cutter
6. Chain
7. Roller nose
8. Bar
9. Chain pitch

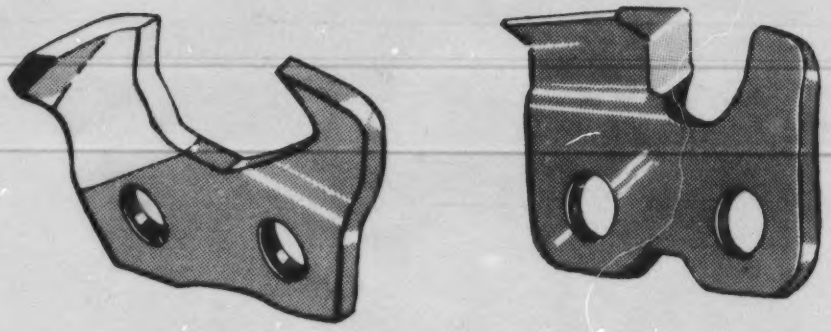
2. Identify the main parts of a chain.



3. Identify the four types of cutters.

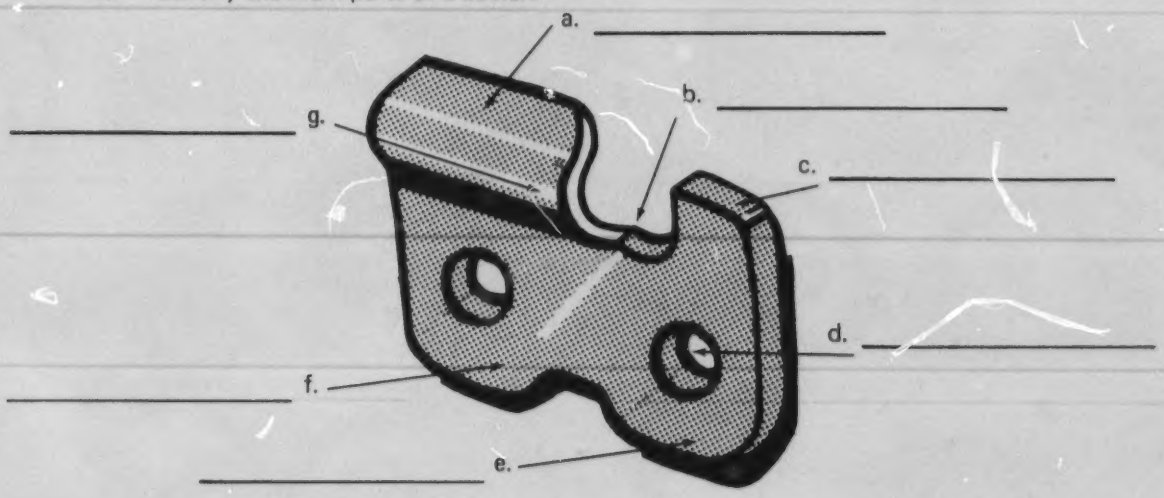


a. _____ b. _____



c. _____ d. _____

4. Identify the main parts of a cutter.



5. List six causes of chain failure.

   a.

   b.

   c.

   d.

   e.

   f.

6. Calculate chain pitch.

   (NOTE: If this activity has not been accomplished prior to the test, ask your instructor when it should be completed.)

CHAINS
UNIT I

ANSWERS TO TEST

1. a. 4 e. 1 i. 9
   b. 3 f. 8
   c. 5 g. 6
   d. 2 h. 7
2. a. Drive link
   b. Tie strap (side link)
   c. Preset cutter, left hand and right hand
   d. Preset tie strap (side link)
   e. Rivet
3. a. Chipper
   Semi and micro chisel
   c. Power sharp
   d. Chisel
4. a. Top plate
   b. Gullet
   c. Depth gauge
   d. Rivet hole
   e. Toe
   f. Heel
   g. Side plate
5. Any six of the following:
   a. Chain improperly adjusted
   b. Worn or damaged bar groove
   c. Lack of lubrication

d. Improper filing or sharpening

e. Abrasion

f. Worn cut roller nose

g. Improper use

h. Damaged sprocket teeth

6. Evaluated to the satisfaction of the instructor

CHAIN SHARPENING
UNIT II

UNIT OBJECTIVE

After completion of this unit, the student should be able to sharpen a chain and adjust the chain depth and tension. This knowledge will be evidenced through demonstration and by scoring eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with chain sharpening to the correct definitions.
2. Name two methods of sharpening chains.
3. List reasons why a chain should be kept sharp.
4. Demonstrate the ability to:
   a. Hand sharpen a chipper type chain.
   b. Gauge a chain for depth.
   c. Adjust chain tension.

CHAIN SHARPENING
UNIT II

SUGGESTED ACTIVITIES

I. Instructor:

A. Provide student with objective sheet.

B. Provide student with information and job sheets.

C. Discuss unit and specific objectives.

D. Discuss information sheet.

E. Demonstrate and discuss the procedures outlined in the job sheets.

F. Discuss files, gauges, holders and filecards

G. Give test.

II. Student:

A. Read objective sheet.

B. Study information sheet.

C. Complete job sheets.

D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

A. Objective sheet

B. Information sheet

C. Transparency masters

1. TM 1--Chain Filing Equipment

2. TM 2--Power Grinder

D. Job sheets

1. Job Sheet #1--Hand Sharpen a Chipper Type Chain

2. Job Sheet #2--Gauge a Chain for Depth

3. Job Sheet #3--Adjust Chain Tension

E. Test

F. Answers to test

II. References--*Chain Saw Service Manual*. Kansas City, Missouri: Technical Publications Division/Intertec Publishing Corporation, 1974.

CHAIN SHARPENING
UNIT II

INFORMATION SHEET

I. Terms and definitions

A. Depth gauge--Portion of the right and left hand cutter which allows the cutting edge to protrude a certain distance into the surface being cut

B. Filing vise--Special tool used for holding the chain so it can be filed and checked for depth

C. File holder--Special tool designed for holding a file to assure correct angle and depth of sharpening

D. File guide--Special tool used for checking and filing the depth gauge

E. Stroke--Forward movement of the file allowing a cutting action to shape the cutter

F. Cutter angle--The angle at which the cutter is filed during chain sharpening

G. Joint--Distance between top of cutter and top of depth gauge

(NOTE : This distance determines how much wood is cut by each pass of a cutter.)

II. Methods of sharpening chains

A. Hand filing (Transparency 1)

B. Machine grinding (Transparency 2)

(NOTE: Due to the differences in machines and procedures for operating them, it is recommended that the equipment manual for each machine be studied thoroughly before sharpening a chain.)

III. Reasons why a chain should be kept sharp

A. Chain saw cuts faster

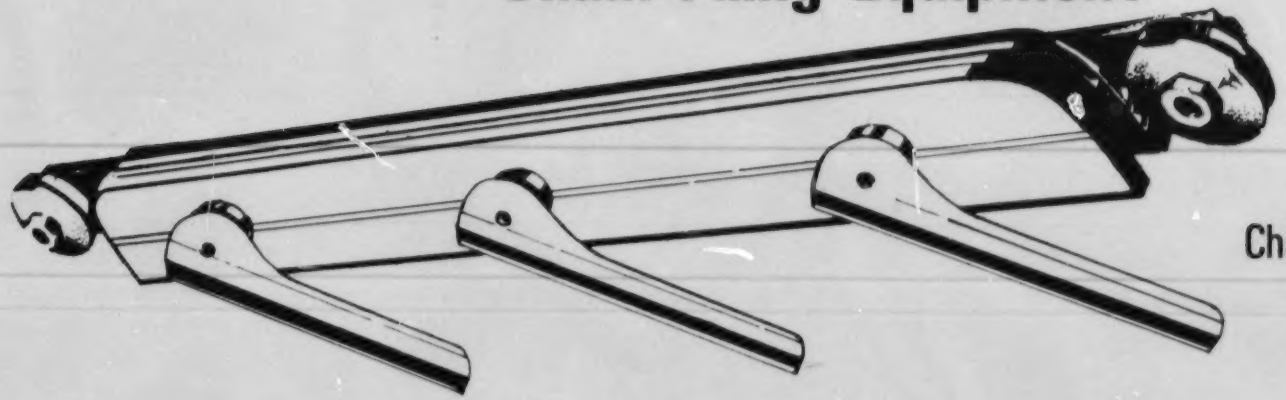
B. Chain saw cuts smoother

C. Operator fatigue is reduced

D. Wear to bar and sprocket is reduced

E. Noise is reduced

Chain Filing Equipment

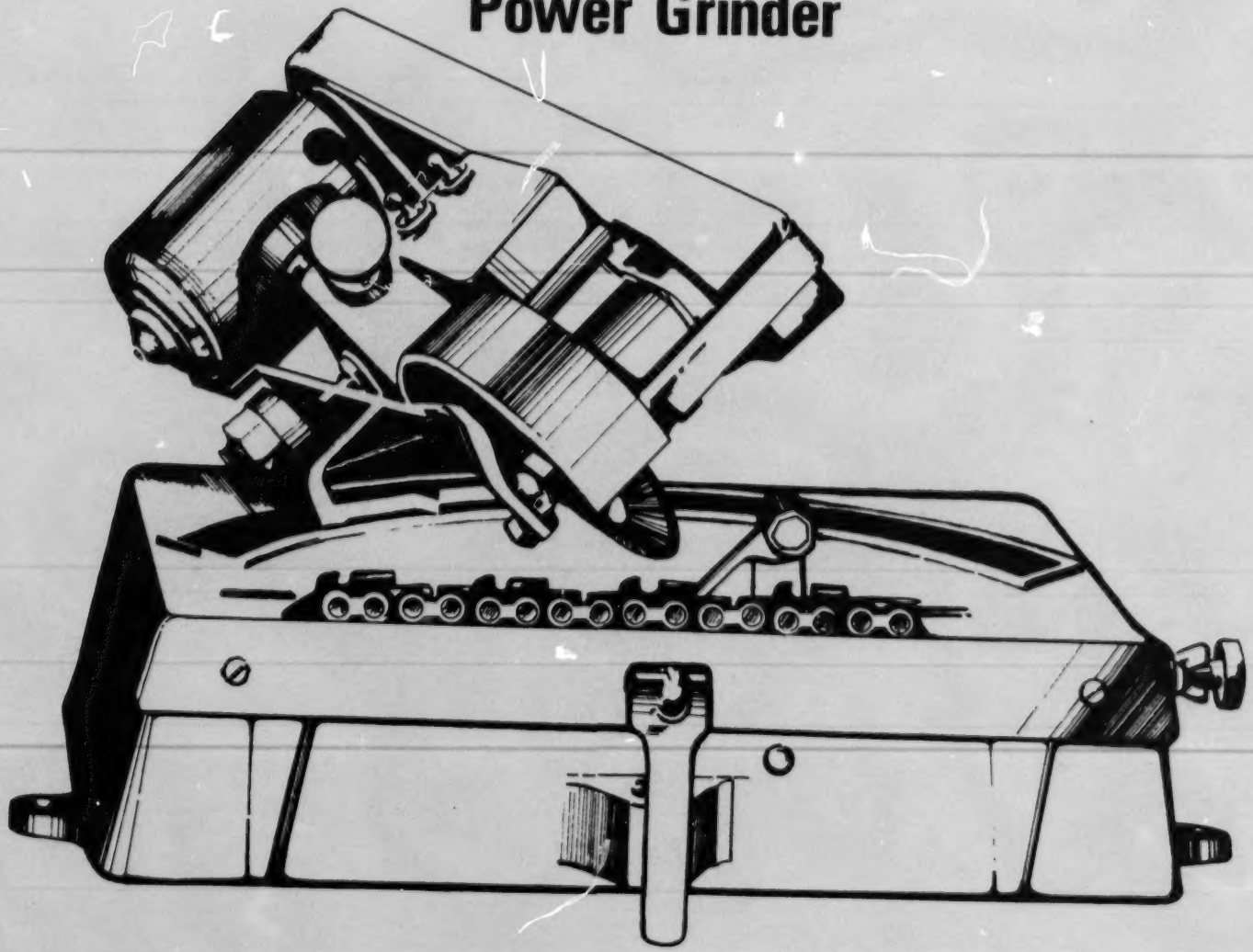


Chain Filing Vise

Full Round File and Holder

File Guide

Power Grinder



TM 2

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CHAIN SHARPENING
UNIT II

JOB SHEET #1--HAND SHARPEN A CHIPPER TYPE CHAIN

I. Tools and materials

A. Safety glasses

B. Chain saw with dull chipper chain

C. Full round chain file and holder

(NOTE: The file diameter will be determined by chain pitch. If you do not have an operator's manual for this saw, use the chart below to select your file.)

Chain Pitch	Round File Size
1/4"	1/8"
.354"	5 mm
3/8"	3/16"
3/8" (S-70)	7/32"
.404"	7/32"
7/16", 1/2"	1/4"
9/16", 5/8"	9/32"
3/4"	5/16"

D. Pair of leather gloves

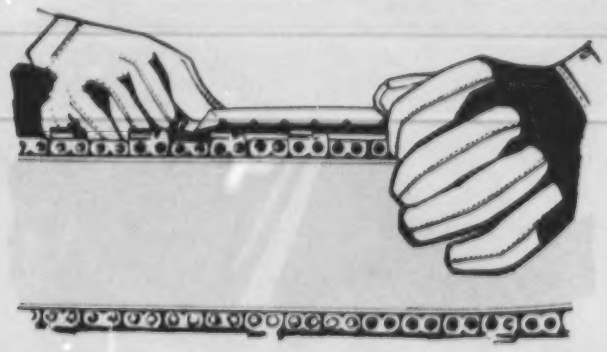
II. Procedure

A. Put on safety glasses and gloves

B. Disconnect the spark plug wire and ground it to the engine block

C. Place file in a cutter (Figure 1)

Figure 1



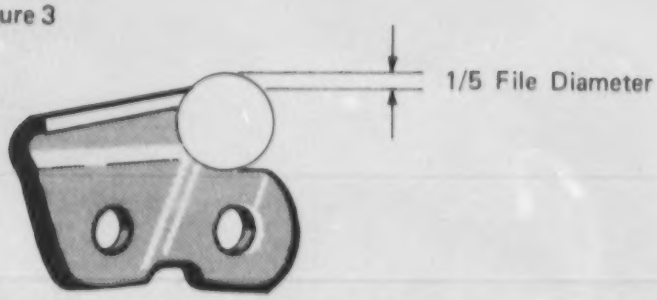
JOB SHEET #1

1. Keep file level at approximately 35° angle (Figure 2)

Figure 2

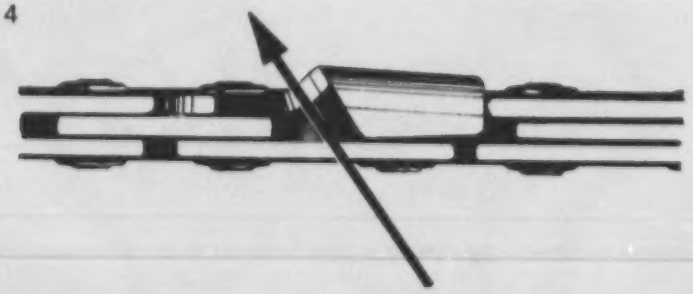
2. Keep approximately 1/5 of the file diameter above the cutter (Figure 3)

Figure 3



D. File from inside out (Figure 4)

Figure 4



(NOTE: Give each cutter 2 strokes. Do not file on back stroke.)

E. Rotate chain with gloved hand until all cutters on one side are sharpened

F. Turn saw around and start on other side of chain

G. File all cutters on this side

H. Have the instructor evaluate your work

CHAIN SHARPENING
UNIT II

JOB SHEET #2--GAUGE A CHAIN FOR DEPTH

I. Tools and materials

A. Safety glasses

B. Chain

C. Bar

D. Bar vise

E. File guide, if available

F. Flat file

G. Appropriate service manual

II. Procedure

(NOTE: If chain is gauged with bar in saw, ground spark plug wire.)

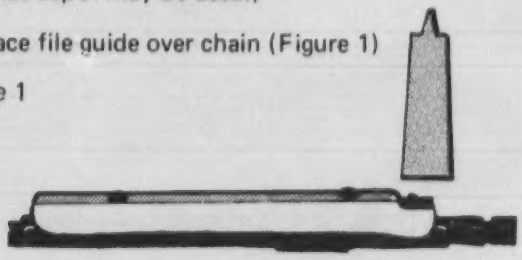
A. Put on safety glasses

B. Check service manual for recommended depth

(NOTE: Manufacturers recommend specific depths at which the chain should be set. Cutting condition and wood conditions will determine what depth may be used.)

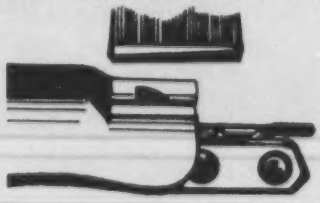
C. Place file guide over chain (Figure 1)

Figure 1



D. File off that portion of the depth gauge above the file guide (Figure 2)

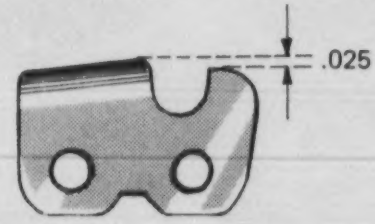
Figure 2



JOB SHEET #2

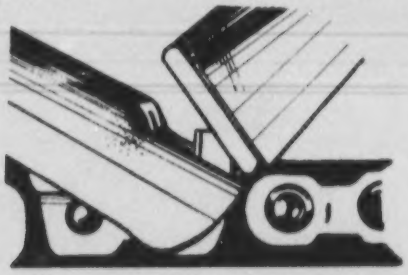
(NOTE: Be certain that all depth gauges are filed the same. Check depth gauge every 3rd or 4th sharpening. See Figure 3.)

Figure 3



E. Round off front corner using tilted file guide to protect top of cutter (Figure 4)

Figure 4



F. Repeat until all depth gauges have been worked

G. Have the instructor evaluate your work

CHAIN SHARPENING
UNIT II

JOB SHEET #3--ADJUST CHAIN TENSION

I. Tools and materials

A. Safety glasses

B. Combination wrench set

C. Standard or phillips screwdriver set

D. Leather glove

E. Recommended chain oil

II. Procedure

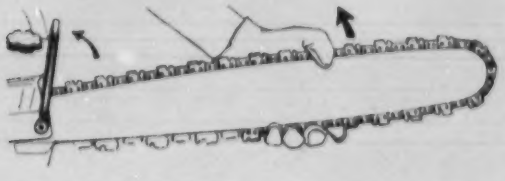
(NOTE: Remove spark plug wire and ground it to the block.)

A. Put on leather glove

(CAUTION: Leather glove should be worn at all times to protect against the sharp edges of the chain.)

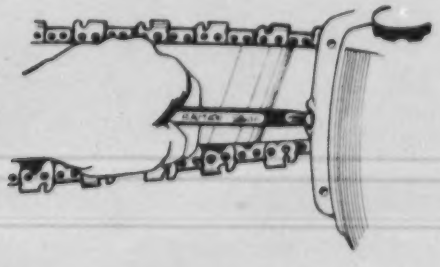
B. Loosen bar nuts (Figure 1)

FIGURE 1



C. Adjust tension screw if saw is so equipped (Figure 2)

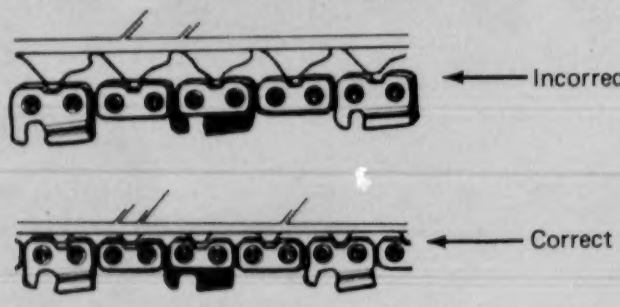
FIGURE 2



JOB SHEET #3

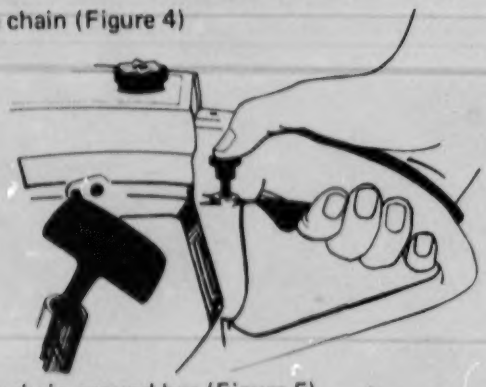
(NOTE: Tighten until chain just touches bottom bar rails. Pull up on chain to make sure it will not come out of groove. See Figure 3.)

FIGURE 3



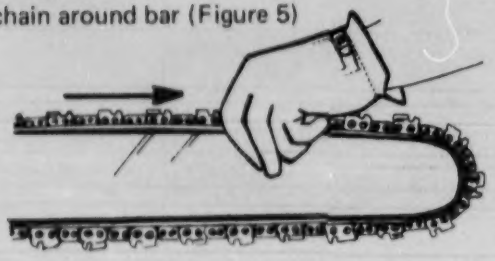
D. Oil the chain (Figure 4)

FIGURE 4



E. Rotate chain around bar (Figure 5)

FIGURE 5



(NOTE: Be sure it fits sprocket and bar.)

F. Hold bar tip up, and tighten nuts (Figure 6)

FIGURE 6

G. Rotate chain again to make sure it moves freely

CHAIN SHARPENING
UNIT II

TEST

NAME _____

1. Match the terms on the right to the correct definitions.

_____a. Special tool designed for holding a file to assure correct angle and depth of sharpening

_____b. Forward movement of the file allowing a cutting action to shape the cutter

_____c. Portion of the right and left hand cutter which allows the cutting edge to protrude a certain distance into the surface being cut

_____d. Special tool used for holding the chain so it can be filed and checked for depth

_____e. Special tool used for checking and filing the depth gauge

_____f. The angle at which the cutter is filed during chain sharpening

_____g. Distance between top of cutter and top of depth gauge

1. Stroke
2. Filing vise
3. File holder
4. File guide
5. Depth gauge
6. Joint
7. Cutter angle

2. Name two methods of sharpening chains.

a.

b.

3. List four reasons why a chain should be kept sharp.

a.

b.

c.

d.

4. Demonstrate the ability to:

   a. Hand sharpen a chipper type chain.

   b. Gauge a chain for depth.

   c. Adjust chain tension.

   (NOTE: If these activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

CHAIN SHARPENING
UNIT II

ANSWERS TO TEST

1. a. 3
   b. 1
   c. 5
   d. 2
   e. 4
   f. 7
   g. 6
2. a. Hand filing
   b. Machine grinding
3. Any four of the following:
   a. Chain saw cuts faster
   b. Chain saw cuts smoother[
   c. Operator fatigue is reduced
   d. Wear to bar and sprocket is reduced
   e. Noise is reduced
4. Performance skills evaluated to the satisfaction of the instructor

CHAIN LINK REPLACEMENT
UNIT III

UNIT OBJECTIVE

After completion of this unit, the student should be able to replace chain links. This knowledge will be evidenced through demonstration and by scoring eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with chain link replacement to the correct definitions.
2. Name the two safety factors for replacing a chain link.
3. Identify the tools used for chain link replacement.
4. Demonstrate the ability to remove and replace a chain link.

CHAIN LINK REPLACEMENT
UNIT III

SUGGESTED ACTIVITIES

I. Instructor:

A. Provide student with objective sheet.

B. Provide student with information and job sheets.

C. Make transparency.

D. Discuss unit and specific objectives.

E. Discuss information sheet.

F. Demonstrate and discuss the procedures outlined in the job sheet.

G. Give test.

II. Student:

A. Read objective sheet.

B. Study information sheet.

C. Complete job sheet.

D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

A. Objective sheet

B. Information sheet

C. Transparency master: TM 1--Tools Used to Replace a Chain Link

D. Job Sheet #1--Remove and Replace a Chain Link

E. Test

F. Answers to test

II. Reference--*Chain Saw Service Manual*. Kansas City: Technical Publications Division/Intertec Publishing Corporation, 1974.

CHAIN LINK REPLACEMENT
UNIT III

INFORMATION SHEET

I. Terms and definitions

A. Pocket chain breaker--Block made of hardened steel, grooved so that rivets can be removed easily with a punch

B. Rivet spinner--Tool used to put factory type round finish on rivet heads

C. Bench chain breaker--Bench mounted tool with a power lever attached to a hardened steel type punch to easily remove rivets

D. Riveting--Connecting links in order to form one continuous chain

II. Safety factors for replacing a chain link

A. File the bottom of a new link to match worn links

B. File a new cutter to match the other cutters on the chain

(CAUTION: If new links are not filed to match existing links, dangerous jerking and vibration will occur when the chain saw is put into operation.)

III. Tools used for chain link replacement (Transparency 1)

A. Pocket chain breaker

B. Bench chain breaker and spinner

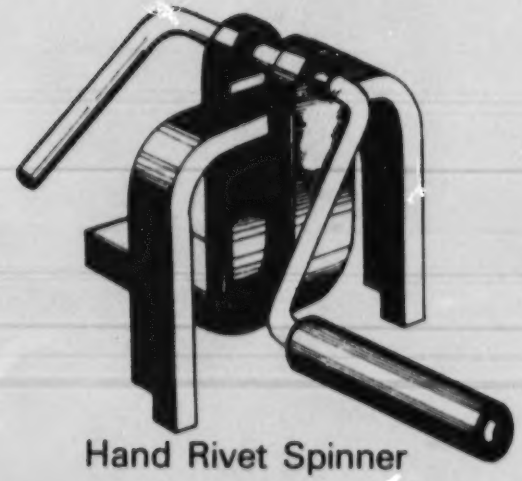
C. Hand rivet spinner

(NOTE: For emergency field repairs, rivet heads can be filed off, links then spread with a screwdriver, repairs made, and then rivet heads can be formed with a ball peen hammer.)

D. Multi-purpose tool

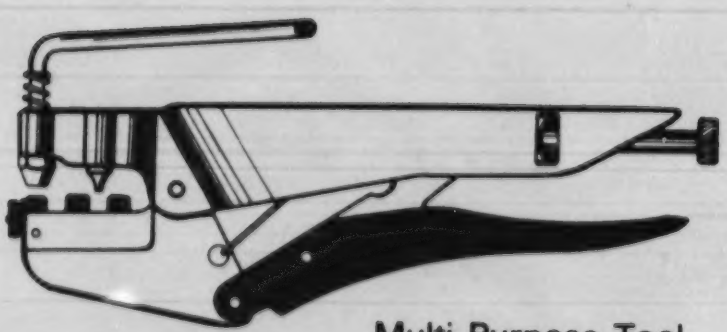
(NOTE: This type of tool can punch out rivets, form new heads, and even form a head on a used rivet in some instances where emergency repairs are needed.)

Tools Used To Replace A Chain Link



Hand Rivet Spinner

Pocket Chain Breaker



Multi-Purpose Tool

Bench Chain
Breaker and Spinner

TM 1

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CHAIN LINK REPLACEMENT
UNIT III

JOB SHEET #1--REMOVE AND REPLACE A CHAIN LINK

I. Tools and materials

A. Saw chain

B. Chain breaker

C. Hand rivet spinner

D. Punch

E. Chain file

F. Mil file and holder

G. Safety glasses

H. Solvent

I. Cleaning tray

J. Shop towels

K. Chain oil

II. Procedure

(NOTE: Disconnect plug wire and ground it to the block before starting.)

A. Remove chain from saw

(NOTE: Be sure and wear safety glasses while pressing out and spinning rivets.)

B. Soak chain in solvent

C. Determine which links need to be replaced

(NOTE: Look for cracked or nicked cutter and damaged depth gauges.)

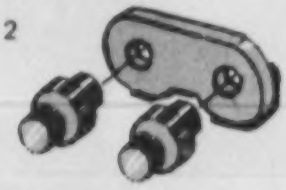
JOB SHEET #1

D. Fit chain into chain breaker (Figure 1)

FIGURE 1

E. Punch out rivets of damaged part (Figure 2)

FIGURE 2



F. File bottom of new part to match worn parts

(NOTE: If a new cutter is added, be sure and file it to match worn cutters.)

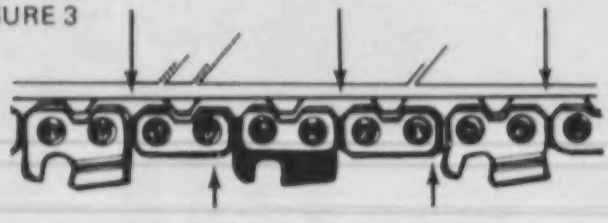
G. Put preset tie strap on flat surface

H. Attach chain on new part

I. Place chain in spinner and rivet head

J. Check chain for tight joints (Figure 3)

FIGURE 3



(NOTE: Bend all chain joints, not just newly installed links.)

JOB SHEET #1

K. Soak chain in oil

L. Dry chain lightly with shop towel

M. Reinstall chain

N. Start saw

O. Run for approximately 5 minutes

(NOTE: Give the chain plenty of oil while running.)

P. Stop saw

Q. Readjust chain tension

R. Have instructor evaluate work

CHAIN LINK REPLACEMENT
UNIT III

TEST

NAME _____

1. Match the terms on the right to the correct definitions.

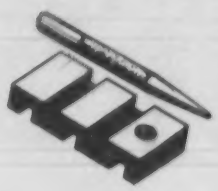
_____a. Tool used to put factory type round finish on rivet heads	1. Pocket chain breaker
_____b. Bench mounted tool with a power lever attached to a hardened steel type punch to easily remove rivets	2. Riveting
_____c. Connecting links in order to form one continuous chain	3. Bench chain breaker
_____d. Block made of hardened steel, grooved so that rivets can be removed easily with a punch	4. Rivet spinner

2. Name the two safety factors for replacing a chain link.

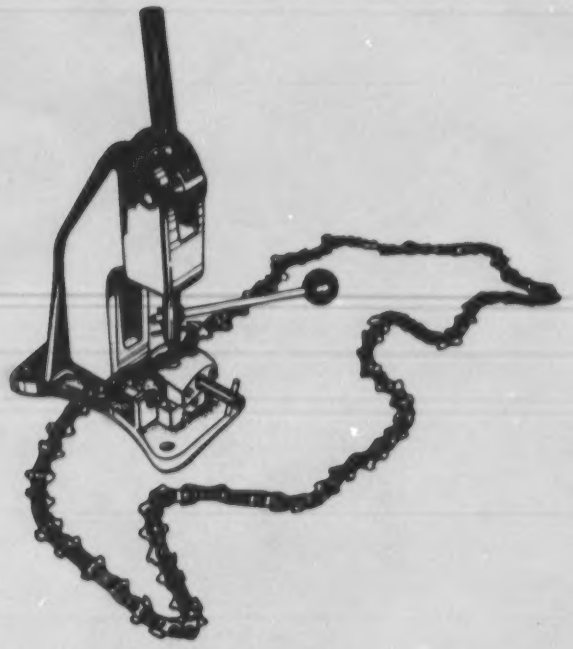
   a. _____

   b. _____

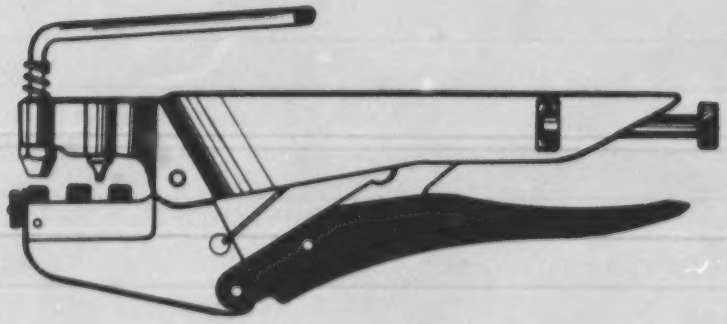
3. Identify the tools used for chain link replacement.



a. _____ b. _____



c. _____



d. _____

4. Demonstrate the ability to remove and replace a chain link.

   (NOTE: If this activity has not been accomplished prior to the test, ask your instructor when it should be completed.)

CHAIN LINK REPLACEMENT
UNIT III

ANSWERS TO TEST

1. a. 4
   b. 3
   c. 2
   d. 1
2. a. File the bottom of a new link to match worn links
   b. File a new cutter to match the other cutters on the chain
3. a. Hand rivet spinner
   b. Pocket chain breaker
   c. Bench chain breaker and spinner
   d. Multi-purpose tool
4. Performance skill evaluated to the satisfaction of the instructor

BARS
UNIT IV

UNIT OBJECTIVE

After completion of this unit, the student should be able to repair a bar. This knowledge will be evidenced through demonstration and by scoring eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with bars to the correct definitions.
2. Name four types of bars used on chain saws.
3. Identify the main parts of a typical bar assembly.
4. Match causes of bar damage to illustrations.
5. Demonstrate the ability to repair a solid nose bar.

BARS
UNIT IV

SUGGESTED ACTIVITIES

I. Instructor:

A. Provide student with objective sheet.

B. Provide student with information sheet.

C. Make transparencies.

D. Discuss unit and specific objectives.

E. Show examples of different types of bars.

F. Show examples of damaged bars.

G. Disassemble a bar so that students can identify parts.

H. Demonstrate and discuss the procedures outlined in the job sheet.

I. Give test.

II. Student:

A. Read objective sheet.

B. Read information sheet.

C. Complete job sheet.

D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

A. Objective sheet

3. Information sheet

C. Transparency masters

1. TM 1--Types of Bars

2. TM 2--Main Parts of a Bar

D. Job Sheet #1--Repair a Solid Nose Bar

BARS
UNIT IV

INFORMATION SHEET

I. Terms and definitions

A. Groove--Portion of the bar in which the drive links run in order to hold the chain into the bar

B. Body--Main part or solid section of the bar

C. Rail--Portion of the bar on which the tie straps of the chain ride enabling the drive links to be guided in a groove

D. Nose tip--Portion of the bar that the chain circles on the tip

E. Roller tip--Special antifriction roller assembly used on some bar tips

F. Mounting slot--Slot in which the bar mounting bolts are received to secure the bar to the engine housing

G. Adjustment pin hole--Hole in the bar in which a chain adjuster fits

H. Oil delivery hole--Hole in bar assembly in which oil is delivered to the bar and chain when the pump is operated

II. Types of bars used on chain saws (Transparency 1)

A. Solid nose bar

B. External roller nose bar

(NOTE: The roller nose needs to be greased at every fueling.)

C. Internal roller nose bar

(NOTE: The roller nose on some models is lubricated by the chain oiler.)

D. Bow bar

III. Main parts of a typical bar assembly (Transparency 2)

A. Groove

B. Body

C. Rail

D. Nose tip

INFORMATION SHEET

E. Roller tip

F. Mounting slot

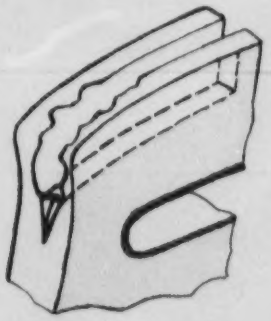
G. Adjustment pin hole

H. Oil delivery hole

IV. Causes of bar damage

A. Rail damage of chain entry (Figure 1)--Crowding at entry when chain is loose

FIGURE 1

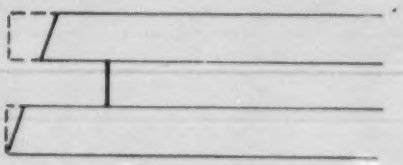


B. Excessive wear on one rail (Figure 2)

1. Inconsistant face angles

2. Unequal joint setting

FIGURE 2



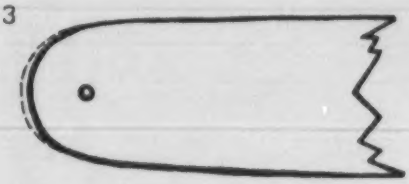
C. Worn nose tip (Figure 3)

1. Excessive chain tension

2. Insufficient lubrication

3. Cutting with dull or damaged cutters

FIGURE 3



INFORMATION SHEET

D. Worn rails (Figure 4)

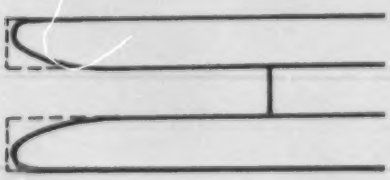
1. Chain slap from loose chain
2. Undercutting with dull or damaged chain
3. Cutting with insufficient joint

FIGURE 4

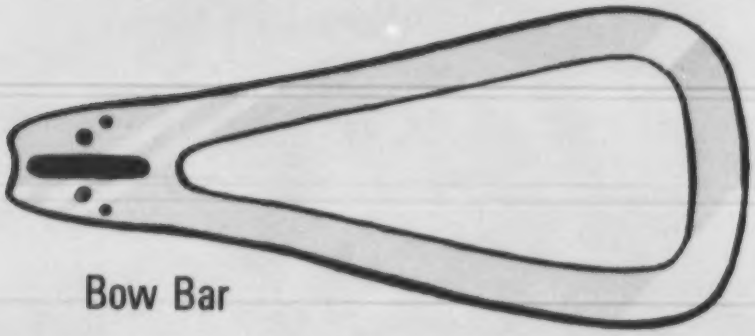
E. Worn inside of rails (Figure 5)

1. Inconsistant face angles
2. Excessive face angles
3. Excessive joint

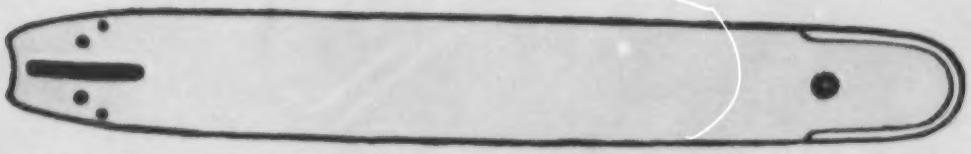
FIGURE 5



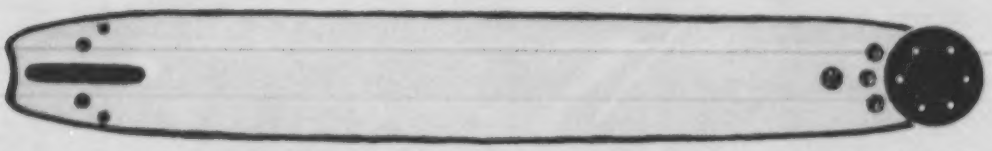
Types of Bars



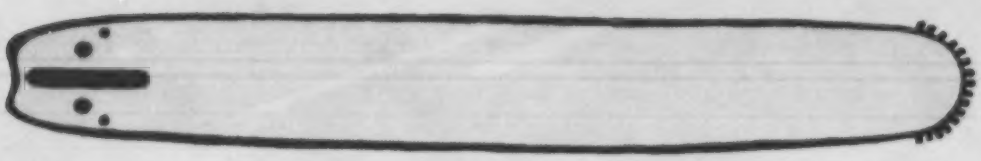
Bow Bar



Solid Nose Bar

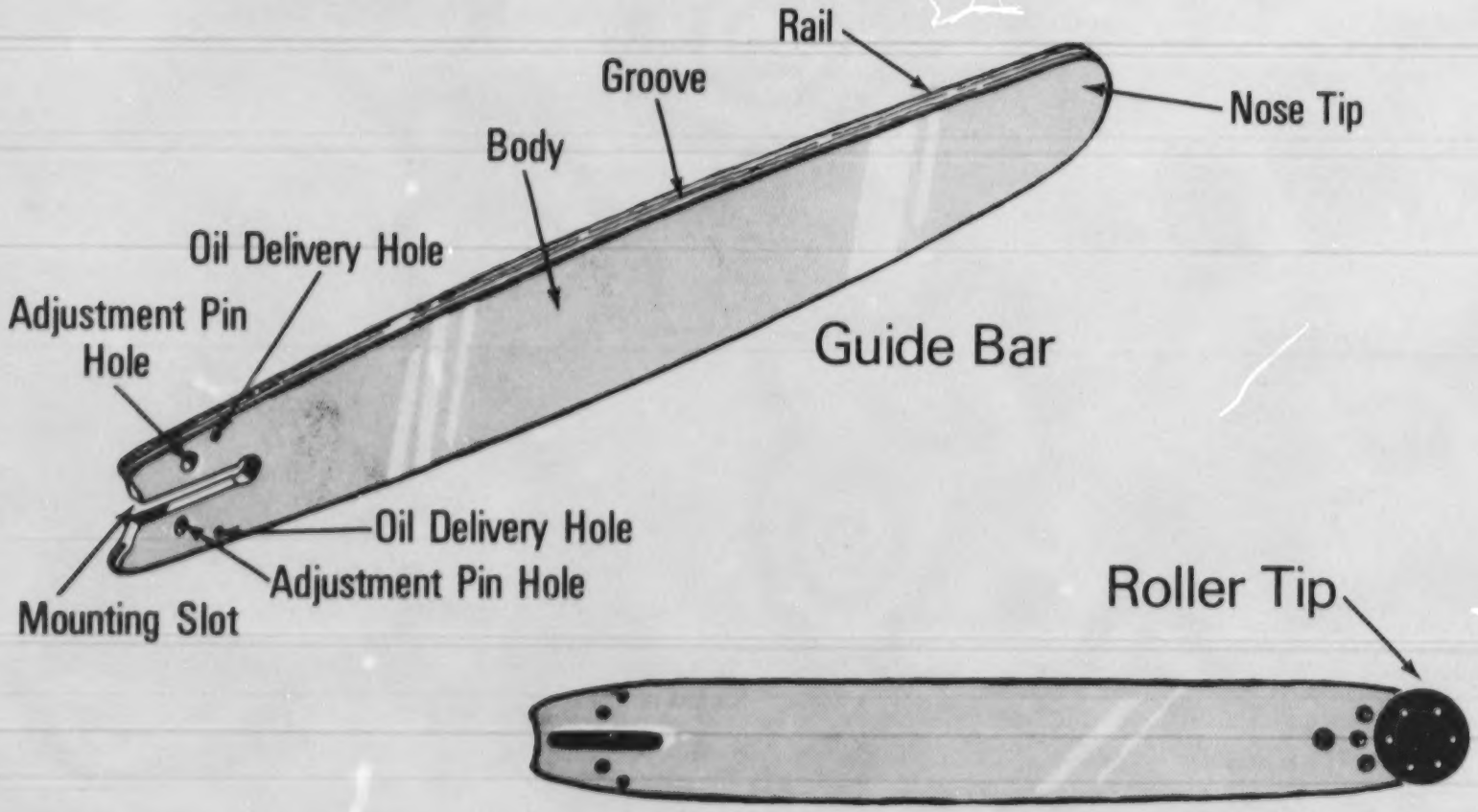


External Roller
Nose Bar



Internal Roller
Nose Bar

Main Parts of a Bar



BARS
UNIT IV

JOB SHEET #1--REPAIR A SOLID NOSE BAR

I. Tools and materials

A. Saw with damaged solid nose bar

B. Vise

C. Anvil or other suitable pounding surface

D. File with handle

E. Ball peen hammer

F. Micrometer, 0"-1"

G. Steel shims

H. Hand tool assortment

I. Safety glasses

J. Solvent

K. Toothpicks

L. Shop towels

M. Parts brush

N. Feeler gauge set

O. File card

P. Flat surface

II. Procedure

(CAUTION: Put on safety glasses and remove and ground spark plug wire before beginning.)

A. Remove bar from saw

1. Remove bar mounting nuts and washers

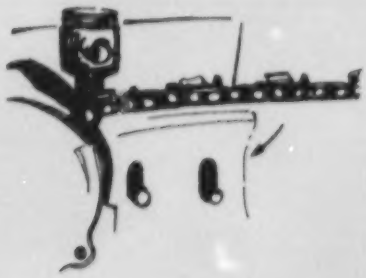
JOB SHEET #1

2. Remove outer cover (Figure 1)

FIGURE 1

(NOTE: If guide bar plates are used, note their position for replacement.See Figure 2.)

FIGURE 2



3. Slide bar back towards clutch

   (NOTE: This will loosen the chain for easy removal. If a screw tensioner is on the saw loosen it to slide the bar back.)

4. Remove the chain

   (NOTE: Soak the chain in oil while repairs are being made.)

5. Lift the bar from the saw

   (NOTE: Keep all parts together for replacement. Don't leave the saw where it could be knocked off a table and damaged.)

B. Clean the bar

1. Clean groove with a toothpick

   (NOTE: Repeat until groove is clean.)

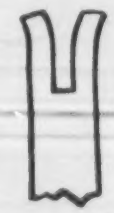
2. Brush solvent in groove and oil passages

3. Dry bar with shop towels

JOB SHEET #1

C. Repair spread or worn rails (Figure 3)

FIGURE 3



1. Measure drive link tang with a micrometer (Figure 4)

FIGURE 4

2. Select appropriate steel shim (Figure 5)

(NOTE: The shim should be .004" to .006" larger than drive tang.)

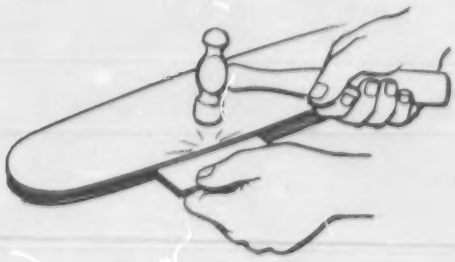
FIGURE 5

3. Lay bar on flat metal surface

4. Place shim in groove

5. Ping lightly on alternate sides with hammer until shim is snug (Figure 6)

FIGURE 6



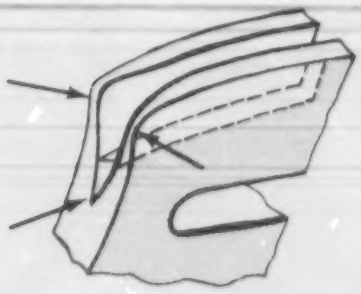
6. Work around bar until all areas have been resized

JOB SHEET #1

D. Repair guide groove opening

1. Place bar in vise
2. File groove into tang opening (Figure 7)

FIGURE 7



E. Check bar for straightness

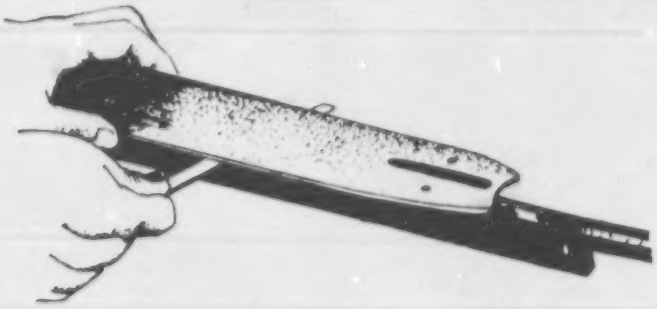
1. Place bar on flat surface

(NOTE: Remove burrs from rails with a file or bar dresser.)

2. Insert .008" feeler gauge between bar and flat surface (Figure 8)

(NOTE: If feeler gauge slips in the bar is bent, and should be replaced.)

FIGURE 8



F. Replace bar on saw

1. Brush groove to remove any filings
2. Mount bar on guide pins

JOB SHEET #1

3. Install chain

   a. Place chain over sprocket and engage drive link tangs in sprocket teeth

   b. Starting at top of bar work the chain into the bar groove

      (NOTE: Make sure you have cutting edges facing forward.)

   c. Turn bar adjusting screw (if applicable to full rear position)

   d. Pull bar forward

      (NOTE: If adjusting screw is used tighten chain lightly with it.)

4. Replace guide bar plate if applicable

5. Replace outer cover, nuts and washers

G. Adjust chain tension

BARS
UNIT IV

NAME _____

TEST

1. Match terms on the right to the correct definitions.

_____a. Hole in bar assembly in which oil is delivered to the bar and chain when the pump is operated

_____b. Main part or solid section of the bar

_____c. Special antifriction roller assembly used on some bar tips

_____d. Portion of the bar in which the drive links run in order to hold the chain into the bar

_____e. Portion of the bar on which the tie straps of the chain ride enabling the drive links to be guided in a groove

_____f. Hole in the bar in which a chain adjuster fits

_____g. Portion of the bar that the chain circles on the tip

_____h. Slot in which the bar mounting bolts are received to secure the bar to the engine housing

1. Roller tip
2. Adjustment pin hole
3. Body
4. Oil delivery hole
5. Nose tip
6. Mounting slot
7. Rail
8. Groove

2. Name four types of bars used on chain saws.

a.

b.

c.

d.

3. Identify the main parts of a bar assembly.

a. _____

b. _____

c. _____

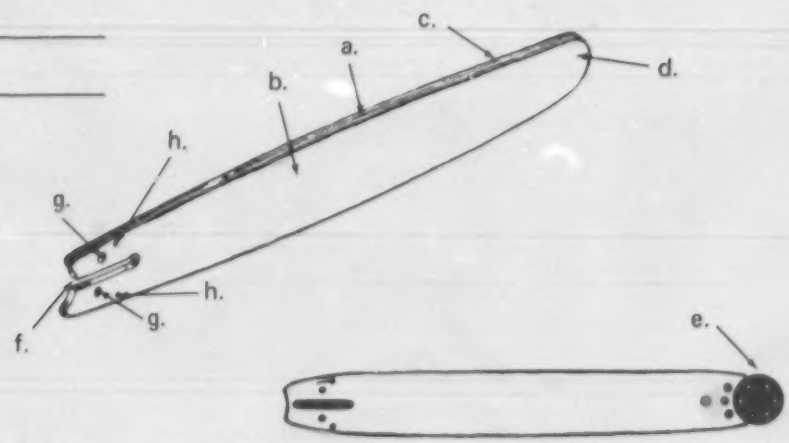
d. _____

e. _____

f. _____

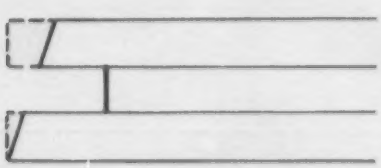
g. _____

h. _____

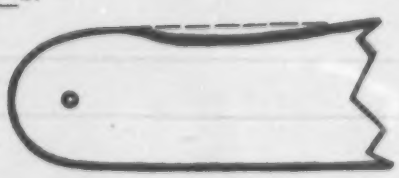


4. Match causes of damaged bars on the right to the correct illustrations.

_____a.



_____b.



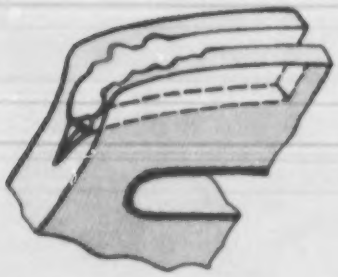
1. a) Inconsistant face angles

   b) Unequal joint setting

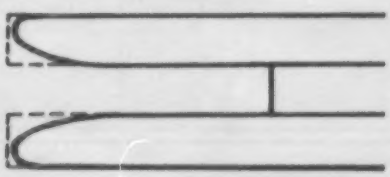
2. Crowding at entry when chain is loose

_____ c.

_____ d.



_____ e.



3. a) Chain slap from loose chain

   b) Undercutting with dull or damaged chain

   c) Cutting with insufficient joint

4. a) Inconsistant face angles

   b) Excessive face angles

   c) Excessive joint

5. a) Excessive chain tension

   b) Insufficient lubrication

   c) Cutting with dull or damaged cutters

5. Demonstrate the ability to repair a solid nose bar.

   (NOTE: If this activity has not been accomplished prior to the test, ask your instructor when it should be completed.)

BARS
UNIT IV

ANSWERS TO TEST

1. a. 4
   b. 3
   c. 1
   d. 8
   e. 7
   f. 2
   g. 5
   h. 6
2. a. Solid nose bar
   b. External roller nose bar
   c. Internal roller nose bar
   d. Bow bar
3. a. Groove
   b. Body
   c. Rail
   d. Nose tip
   e. Roller tip
   f. Mounting slot
   g. Adjustment pin hole
   h. Oil delivery hole
4. a. 1
   b. 3
   c. 5
   d. 2
   e. 4
5. Performance skills evaluated to the satisfaction of the instructor

CHAIN OILERS
UNIT V

UNIT OBJECTIVE

After completion of this unit, the student should be able to match terms associated with chain oilers and types of chain oilers to their definitions and operational descriptions. The student should also be able to name types and categories of chain oilers and check a chain oiler for proper operation. This knowledge will be evidenced through demonstration by scoring eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with chain oilers to the correct definitions.
2. Name three basic categories of chain oilers.
3. Identify four types of automatic chain oilers.
4. Match the types of automatic chain oilers to a description of their operation.
5. Demonstrate the ability to check a chain oiler for proper operation.

CHAIN OILERS
UNIT V

SUGGESTED ACTIVITIES

I. Instructor:

A. Provide student with objective sheet.

B. Provide student with information sheet.

C. Make transparencies.

D. Discuss unit and specific objectives.

E. Discuss information sheet.

F. Show students variations of basic pumps.

G. Disassemble and repair a manual and an automatic oiler pump.

H. Give test.

II. Student:

A. Read objective sheet.

B. Study information sheet.

C. Complete job sheet.

D. Take test

INSTRUCTIONAL MATERIALS

I. Included in this unit:

A. Objective sheet

B. Information sheet

C. Transparency masters

1. TM 1--Pulsation Pump

2. TM 2--Cylinder Check Valve Pump

3. TM 3--Cam Operated Pump

4. TM 4--Gear Drive Pump

D. Job Sheet #1--Check a Chain Oiler for Proper Operation

E. Test

F. Answers to test

II. References--*Chain Saw Service Manual.* Kansas City, Missouri: Technical Publications Division/Intertec Publishing Corporation, 1974.

CHAIN OILERS
UNIT V

INFORMATION SHEET

I. Terms and definitions

A. Oiler pump--Mechanical device used to force oil from a reservoir to the bar for lubrication during sawing operation

B. Manual oiler pump--Nonautomatic oiler pump which is activated by the machine operator

C. Automatic oiler pump--Oiler pump which is driven by some form of engine related force; runs automatically when engine is operating

D. Oil reservoir--Tank which stores oil to be transferred to the bar for lubrication during sawing operations

E. Regulator valve--Adjustable metering device found on some saws; can be adjusted to control amount of oil to bar, and cannot be completely shut off

F. Check valve--Device which allows pressurized fluids to pass in only one direction

(NOTE: A check valve usually has a spring, ball, and seat to accomplish this one way flow.)

G. Pulsation pump--Automatic oiler pump which supplies oil through pressure from a diaphragm which is pulsated by crankcase pressures

H. Cylinder check valve pump--Automatic oiler pump which supplies oil by pressurizing the tank with cylinder pressure through a check valve

I. Cam operated pump--Automatic oiler pump which supplies oil through a reciprocating plunger pump driven by crankshaft cam

J. Gear drive pump--Automatic oiler pump which supplies oil through a reciprocating plunger pump driven by a crankshaft gear

II. Categories of chain oilers

A. Manual

(NOTE: This type of oiler relies on the operator to initiate oiling action.)

B. Automatic

(NOTE: This type of oiler automatically provides oiling.)

C. Combination automatic with manual

(NOTE: This system automatically oils and can be supplemented by manual action of operator.)

INFORMATION SHEET

III. Types of automatic chain oilers

A. Pulsation pump (Transparency 1)

B. Cylinder check valve pump (Transparency 2)

C. Cam operated pump (Transparency 3)

D. Gear drive pump (Transparency 4)

IV. Operation of automatic chain oilers

A. Pulsation pump (Transparency 1)

1. Engine crankcase develops a vacuum

a. Diaphragm is drawn inward during vacuum

b. Diaphragm pulls pump piston downward

c. Pump piston vacuum draws oil from reservoir through manual pump into metering chamber

2. Engine crankcase pressurizes

a. Diaphragm is pushed outward

b. Piston is pushed upward blocking oil inlet

c. Piston upward movement pressurizes the metering chamber

d. Pressure forces check valve ball off of seat and oil passes

e. Pressure forces oil through the transfer line to the bar

B. Cylinder check valve pump (Transparency 2)

1. Cylinder pressurizes

a. Pressure forces cylinder check valve open

b. Pressure passes through reservoir check valve into oil reservoir

c. Pressure in reservoir forces oil through manual oiler pump

d. Throttle action opens system valve

(NOTE: This valve keeps pressure in reservoir from pushing oil to the bar except when the throttle is in use.)

e. Oil passes through system valve in transfer lines to regulator valve

f. Regulator valve meters oil flow to bar

INFORMATION SHEET

2. Cylinder develops a vacuum

   a. Cylinder check valve closes

   b. Reservoir check valve closes

   (NOTE: When closed, these valves lock the pressure in the reservoir.)

C. Cam operated pump (Transparency 3)

1. Cam pushes in plunger

   a. Cam pushes piston forward

   b. Piston seals off inlet port and pressurizes the trapped oil in front of it

   c. Pressurized oil forces check ball off seat

   d. Oil travels to metering chamber

   e. Metering chamber transfers oil to outlet port

   (NOTE: The oil flow control screw regulates the amount of oil going to the bar by metering the amount of oil returning to the reservoir.)

2. Cam allows plunger return

   a. Piston drops back past inlet port

   b. Oil from reservoir comes into pump body

D. Gear drive pump (Transparency 4)

1. Crankshaft rotates while engine runs

2. Crankshaft gear drives pump gear

3. Cut cam groove in pump shaft rides on cam screw

4. Rotation of shaft and cam action causes reciprocal strokes

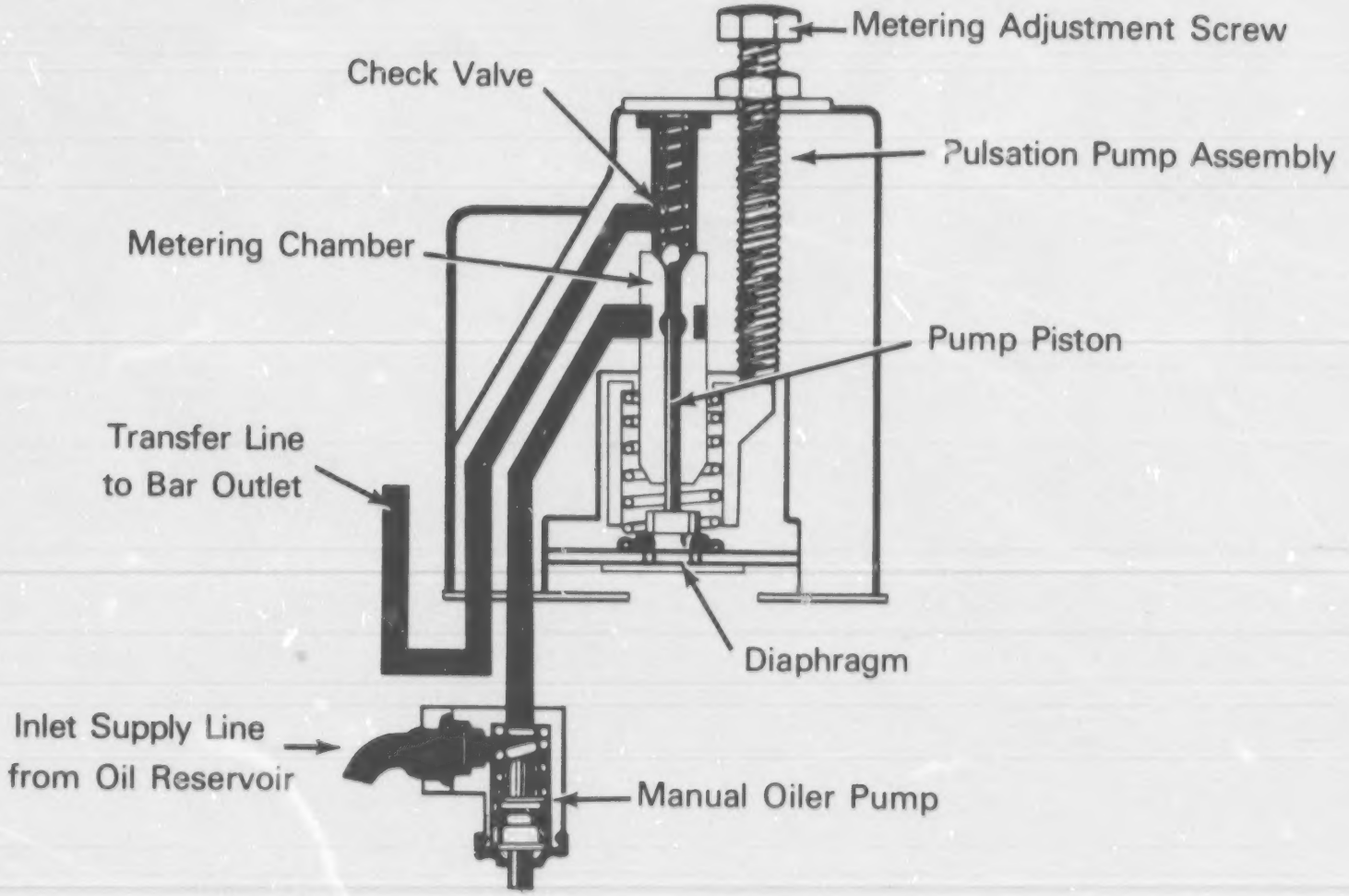
5. Rotating pump shaft flat allows oil to enter at the inlet port while upward movement pulls oil in

6. Further rotation seals inlet port and opens outlet

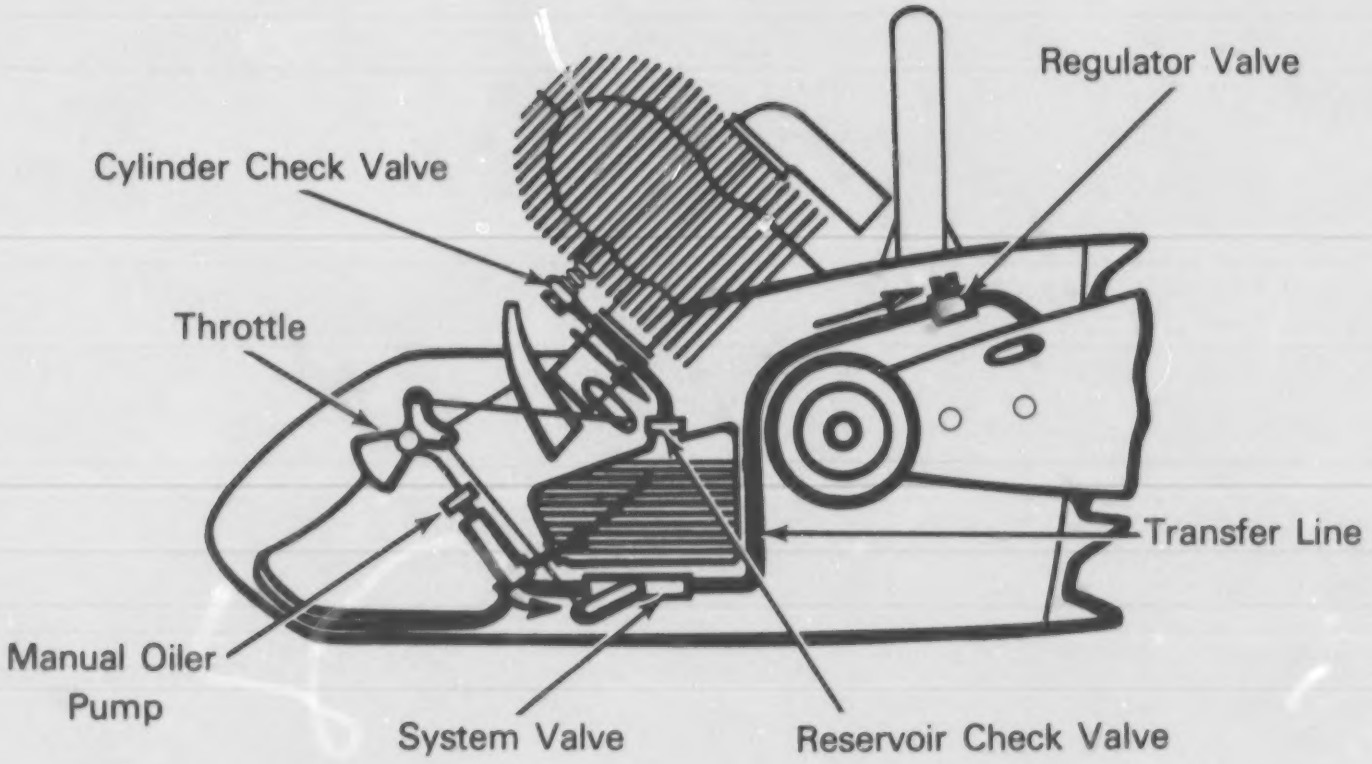
7. Reciprocal movement from further rotation forces oil to outlet port

8. Outlet port allows oil to flow to bar

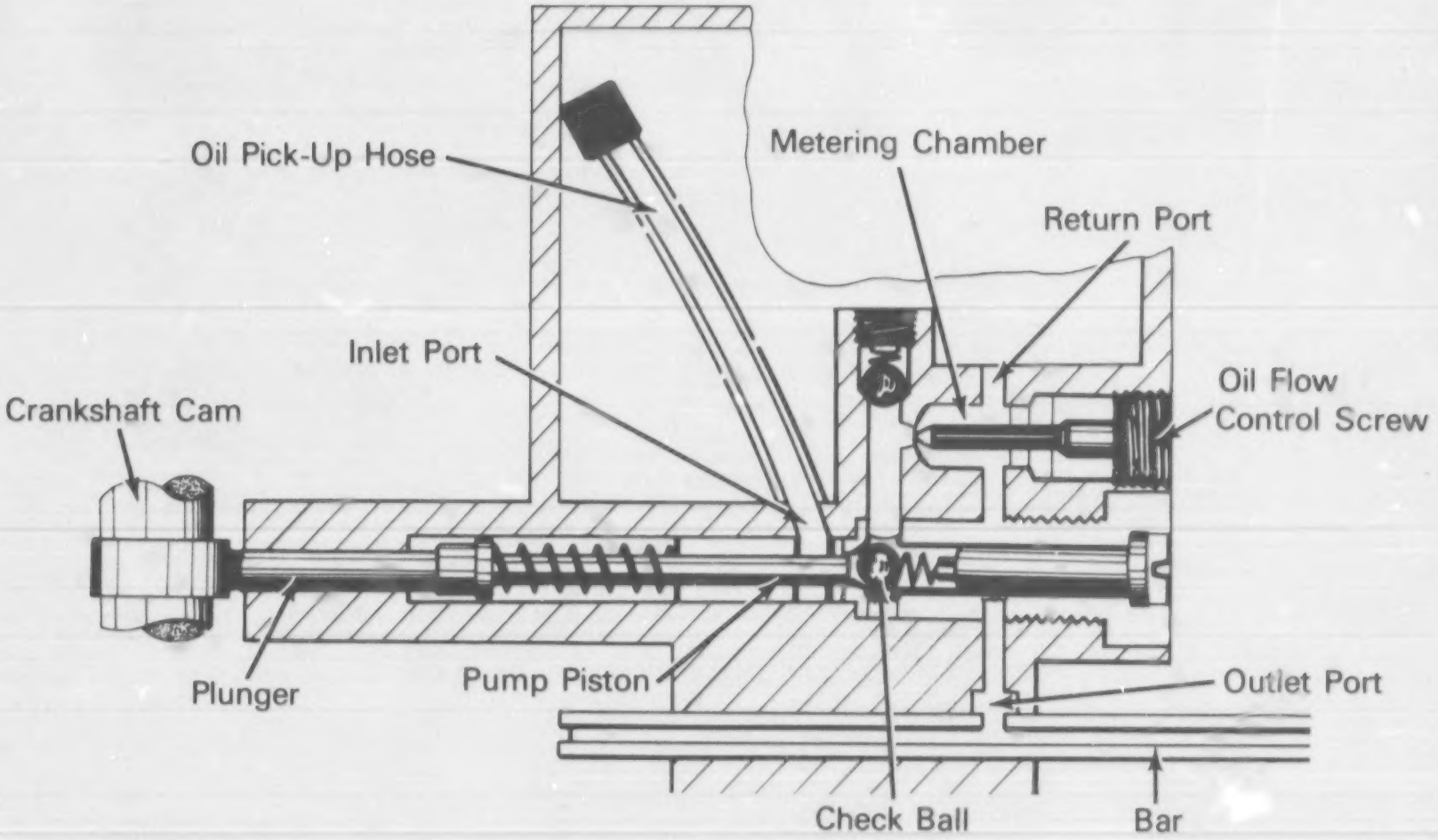
Pulsation Pump



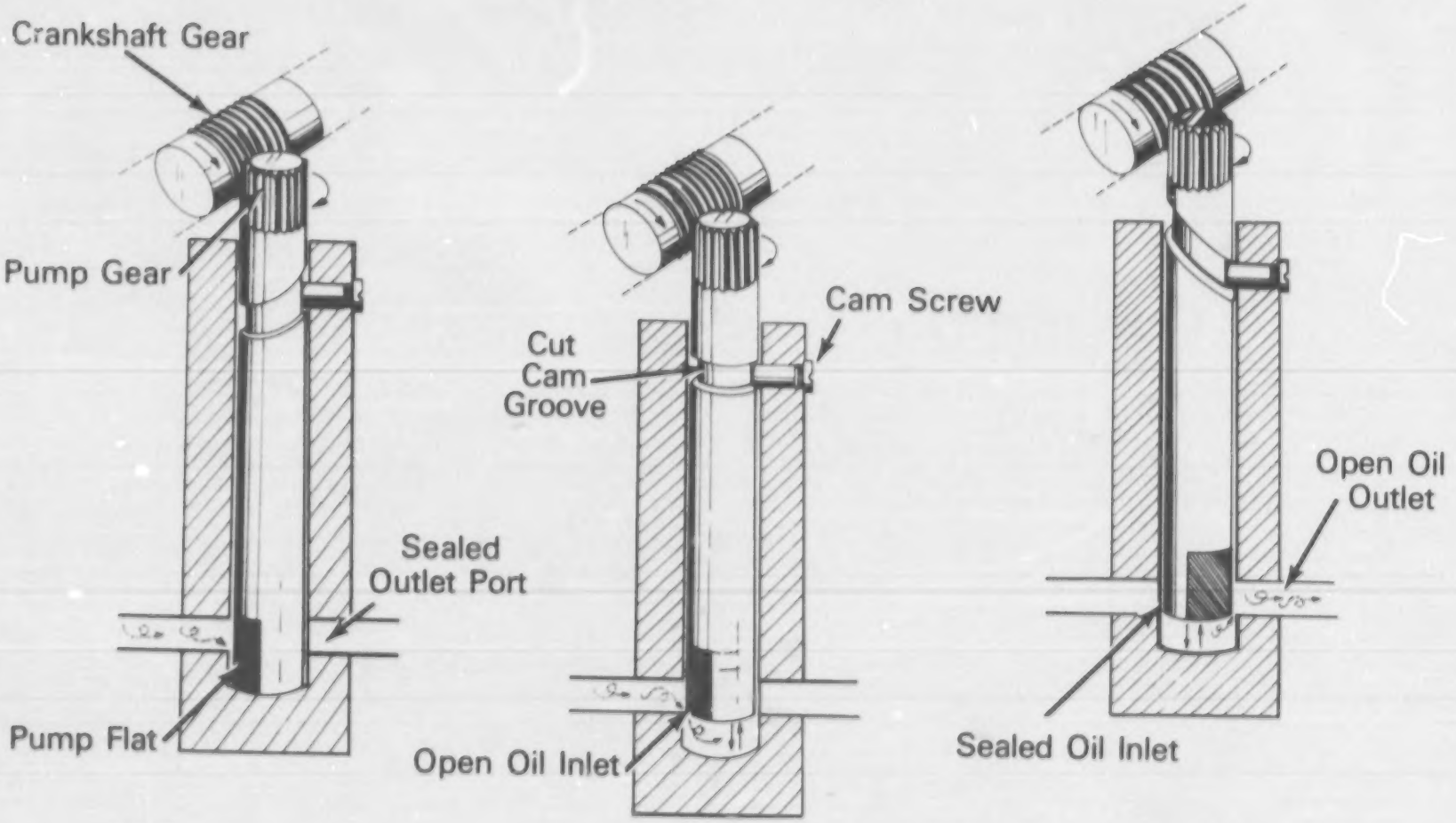
Cylinder Check Valve Pump



Cam Operated Pump



Gear Drive Pump



CHAIN OILERS
UNIT V

JOB SHEET #1--CHECK A CHAIN OILER FOR PROPER OPERATION

I. Tools and materials

A. Working chain saw

B. Paper or clean board

C. Well ventilated test space

D. Safety glasses

II. Procedure

A. Put on safety glasses

B. Check fuel level

C. Check oil reservoir

D. Place saw on flat surface

E. Start saw

F. Hold saw at approximate 45° angle about 1" from board or paper

G. Operate saw at about 1/2 speed

(NOTE: Pump oiler on manual saws at manufacturer's recommended intervals.)

H. Check oil spray pattern on board or paper

(NOTE: There should be a consistent light mist on the board or paper. Repair if this is not evident.)

I. Shut off saw

J. Clean up area

CHAIN OILER
UNIT V

NAME _____

TEST

1. Match the terms on the right to the correct definitions.

_____a. Mechanical device used to force oil from a reservoir to the bar for lubrication during sawing operation

_____b. Nonautomatic oiler pump which is activated by the machine operator

_____c. Oiler pump which is driven by some form of engine related force; runs automatically when engine is operating

_____d. Tank which stores oil to be transferred to the bar for lubrication during sawing operations

_____e. Adjustable metering device found on some saws; can be adjusted to control amount of oil to bar, and cannot be completely shut off

_____f. Device which allows pressurized fluids to pass in only one direction

_____g. Automatic oiler pump which supplies oil through pressure from a diaphragm which is pulsated by crankcase pressures

_____h. Automatic oiler pump which supplies oil by pressurizing the tank with cylinder pressure through a check valve

_____i. Automatic oiler pump which supplies oil through a reciprocating plunger pump driven by crankshaft cam

_____j. Automatic oiler pump which supplies oil through a reciprocating plunger pump driven by a crankshaft gear

1. Automatic oiler pump
2. Cylinder check valve pump
3. Gear drive pump
4. Manual oiler pump
5. Check valve
6. Oiler pump
7. Oil reservoir
8. Cam operated pump
9. Pulsation pump
10. Regulator valve

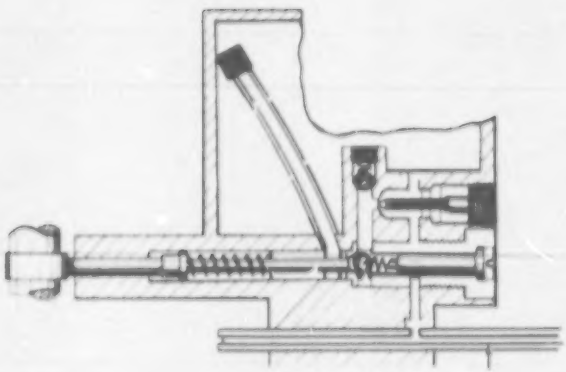
2. Name three basic categories of chain oilers.

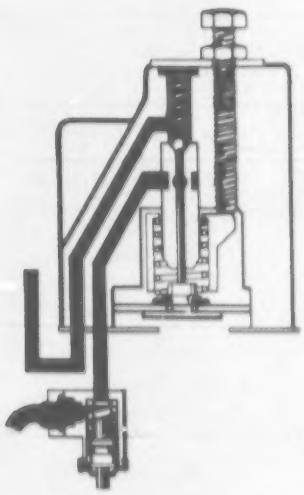
a.

b.

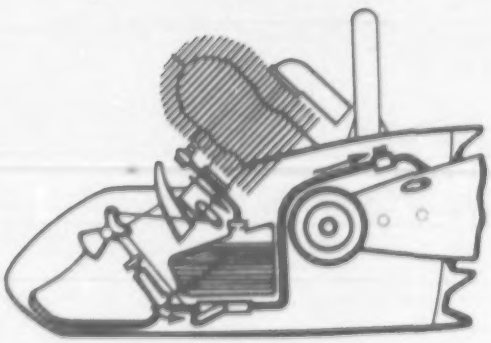
c.

3. Identify four types of automatic chain oilers.

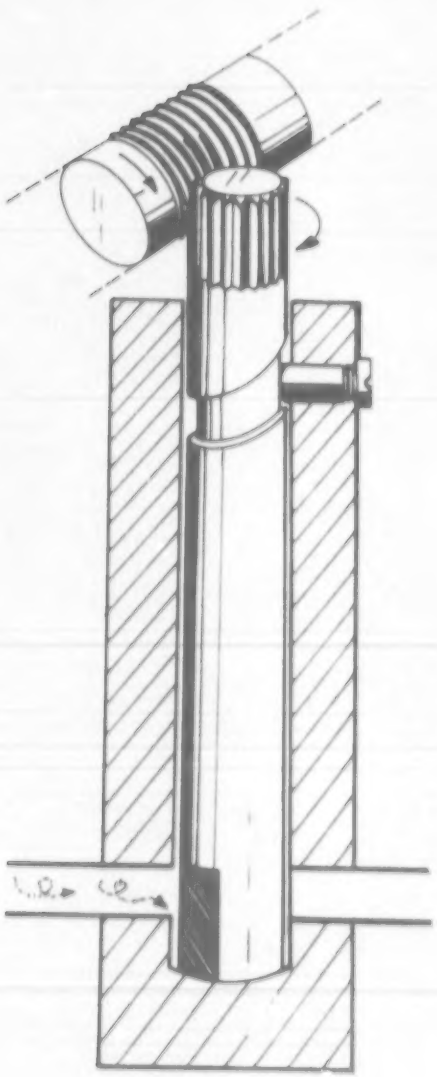




a. _____ b. _____



c. _____



d. _____

4. Match the types of automatic chain oilers on the left to the descriptions of their operation.

_____a. 1. Engine crankcase develops a vacuum

   a. Diaphragm is drawn inward during vacuum

   b. Diaphragm pulls pump piston downward

   c. Pump piston vacuum draws oil from reservoir through manual pump into metering chamber

2. Engine crankcase pressurizes

   a. Diaphragm is pushed outward

   b. Piston is pushed upward blocking oil inlet

   c. Piston upward movement pressurizes the metering chamber

   d. Pressure forces check valve ball off of seat and oil passes

   e. Pressure forces oil through the transfer line to the bar

_____b. 1. Cylinder pressurizes

   a. Pressure forces cylinder check valve open

   b. Pressure passes through reservoir check valve into oil reservoir

   c. Pressure in reservoir forces oil through manual oiler pump

   d. Throttle action opens system valve

   e. Oil passes through system valve in transfer lines to regulator valve

   f. Regulator valve meters oil flow to bar

2. Cylinder develops a vacuum

   a. Cylinder check valve closes

   b. Reservoir check valve closes

1. Cam operated pump
2. Cylinder check valve pump
3. Gear drive pump
4. Pulsation pump

_____c. 1. Cam pushes in plunger

a. Cam pushes piston forward

b. Piston seals off inlet port and pressurizes the trapped oil in front of it

c. Pressurized oil forces check ball off seat

d. Oil travels to metering chamber

e. Metering chamber transfers oil to outlet port

2. Cam allows plunger return

a. Piston drops back past inlet port

b. Oil from reservoir comes into pump body

_____d. 1. Crankshaft rotates while engine runs

2. Crankshaft gear drives pump gear

3. Cut cam groove in pump shaft rides on cam screw

4. Rotation of shaft and cam action causes reciprocal strokes

5. Rotating pump shaft flat allows oil to enter at the inlet port while upward movement pulls oil in

6. Further rotation seals inlet port and opens outlet

7. Reciprocal movement force from further rotation forces oil to outlet port

8. Outlet port allows oil to flow to bar

5. Demonstrate the ability to check a chain oiler for proper operation.

(NOTE: If this activity has not been accomplished prior to the test ask your instructor when it should be completed.)

CHAIN OILERS
UNIT V

ANSWERS TO TEST

1. a. 6 f. 5
   b. 4 g. 9
   c. 1 h. 2
   d. 7 i. 8
   e. 10 j. 3
2. a. Manual
   b. Automatic
   c. Combination automatic with manual
3. a. Cam operated pump
   b. Pulsation pump
   c. Cylinder check valve pump
   d. Gear drive pump
4. a. 4
   b. 2
   c. 1
   d. 3
5. Performance skill evaluated to the satisfaction of the instructor

CHAIN SAW DRIVES
UNIT VI

UNIT OBJECTIVE

After completion of this unit, the student should be able to remove, inspect, service and replace a direct drive assembly. This knowledge will be evidenced through demonstration and by scoring eighty-five percent on the unit test.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms associated with chain saw drives to the correct definitions.
2. List two types of chain saw drives.
3. Identify two types of drive sprockets.
4. Identify basic parts of a gear reduction assembly.
5. Identify basic parts of a direct drive assembly.
6. Demonstrate the ability to remove, inspect, service, and replace a direct drive assembly.

CHAIN SAW DRIVES
UNIT VI

SUGGESTED ACTIVITIES

I. Instructor:

A. Provide student with objective sheet.

B. Provide student with information and job sheets.

C. Make transparencies.

D. Discuss unit and specific objectives.

E. Discuss information and job sheets.

F. Demonstrate and discuss the procedures outlined in the job sheets.

G. Show examples of gear drive systems.

H. Give test.

II. Student:

A. Read objective sheet.

B. Study information sheet.

C. Complete job sheet.

D. Take test.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

A. Objective sheet

B. Information sheet

C. Transparency masters

1. TM 1--Types of Sprockets

2. TM 2--Parts of a Gear Reduction Assembly

3. TM 3--Parts of a Direct Drive Assembly

D. Job Sheet #1--Remove, Inspect, Service and Replace a Direct Drive Assembly

E. Test

F. Answers to test

II. Refereces--*Chain Saw Service Manual*. Kansas City, Missouri: Technical Publication's Division/Intertec Publishing Corporation, 1974.

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INFORMATION SHEET

I. Terms and definitions

A. Sprocket--Device which the cutter chain drive links ride on or in as the drive assembly transfers crankshaft power to the chain

B. Centrifugal clutch--Power transfer assembly which uses centrifugal force to engage shoes to a drum

C. Idler gear--Gear placed between driving and driven gears in a gear system to maintain direction of rotation of driving gear

D. Bearing--Device used to reduce friction between moving parts

E. Gear reduction--System of mated gears designed to reduce the output speed and increase the torque of the system before it is applied to work

F. Direct drive--System using clutch and sprocket assembly to transfer power from crankshaft to chain

II. Types of drives

A. Direct

B. Gear reduction

III. Tyres of drive sprockets (Transparency 1)

A. Self aligning

B. Integral star sprocket and clutch drum

IV. Parts of a gear reduction assembly (Transparency 2)

A. Idler gear post

B. Crankshaft

C. Oil pump drive and sprocket gear shaft

D. Idler gear assembly

E. Clutch assembly with drive gear

F. Sprocket gear

INFORMATION SHEET

V. Basic parts of a direct drive assembly (Transparency 3)

A. Clutch drum or cup

(NOTE: This can be either the self aligning sprocket or the star sprocket and drum.)

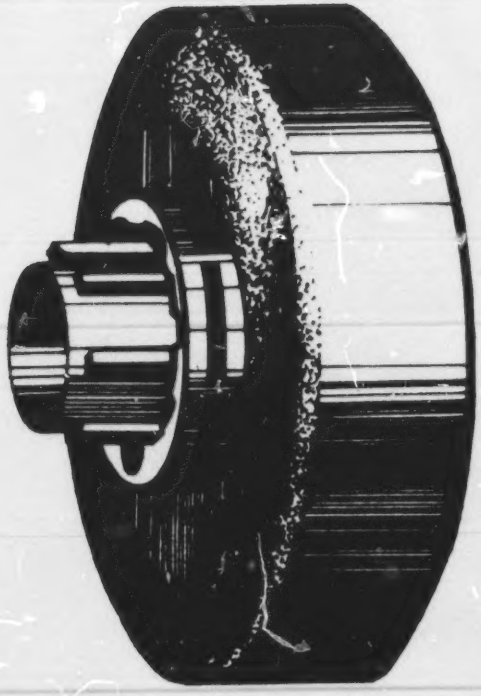
B. Clutch assembly

(NOTE: There are any number of types of clutch assemblies. They are all centrifugal and require some type of shoe to drum friction arrangement.)

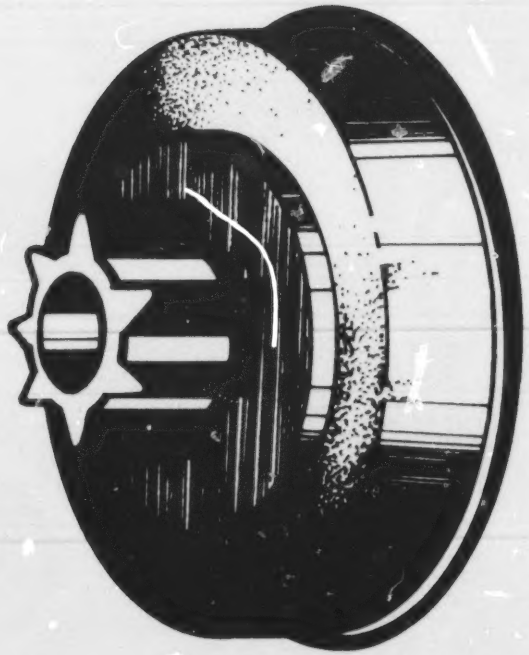
C. Bearings

(NOTE: These can be either needle or sleeve.)

Types of Sprockets

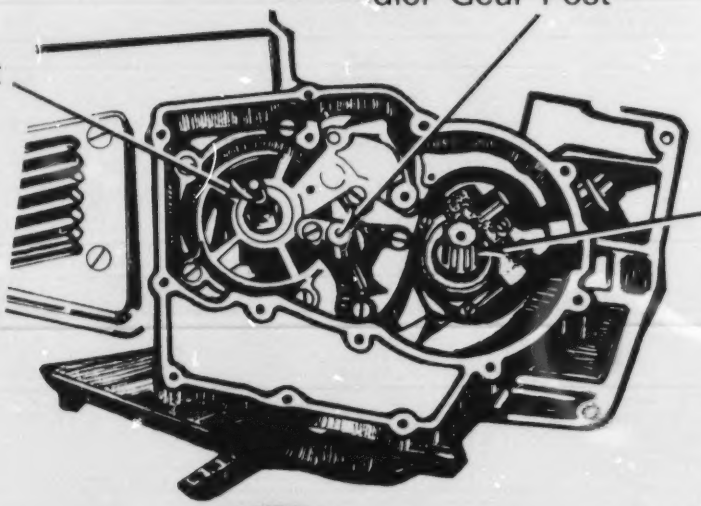


Self Aligning Sprocket

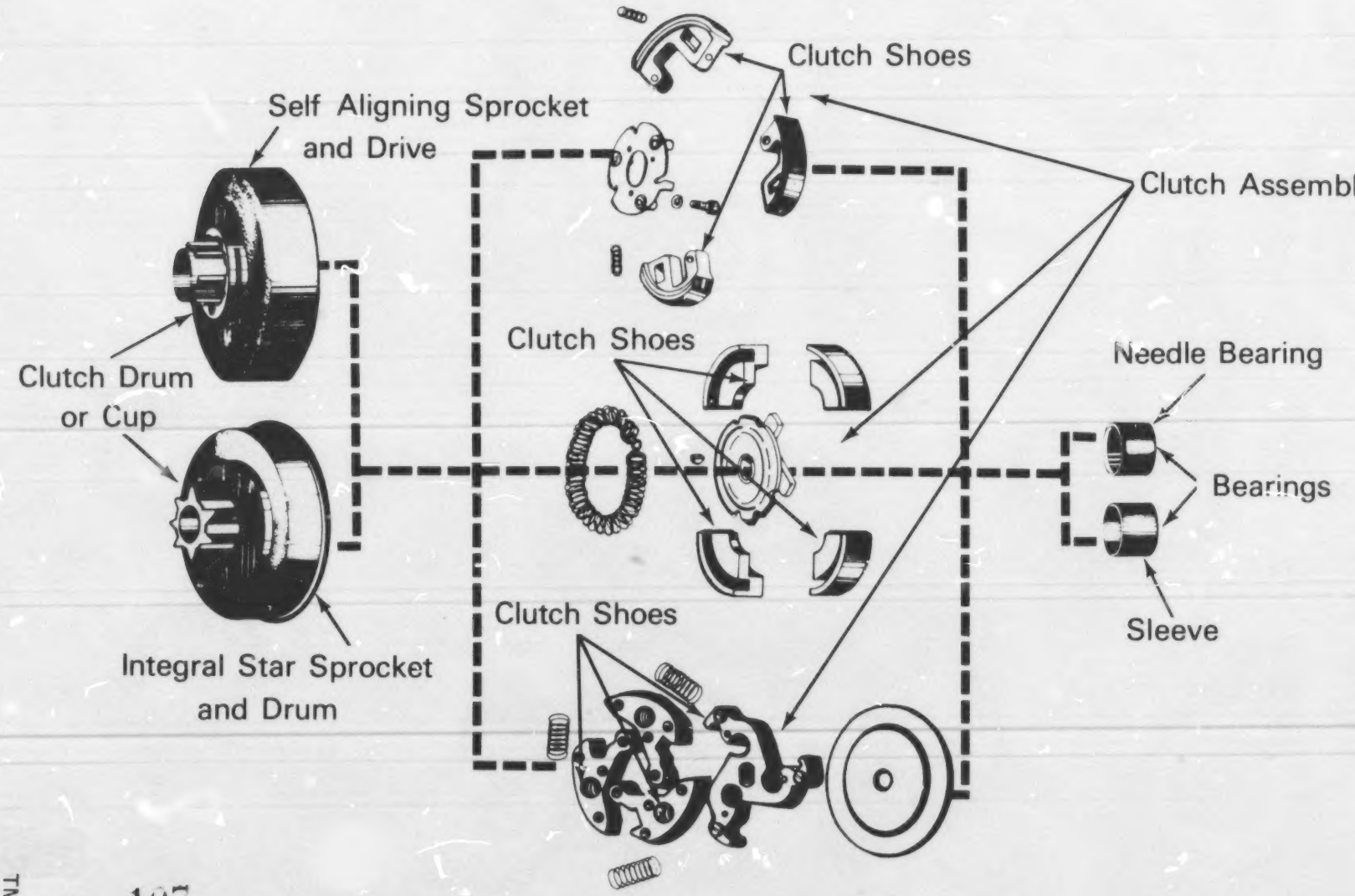


Integral Star Sprocket

Parts of A Gear Reduction Assembly



Parts of A Direct Drive Assembly



TM 3

CS 119

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JOB SHEET #1--REMOVE, INSPECT, SERVICE, AND REPLACE A DIRECT DRIVE ASSEMBLY

I. Tools and materials

A. Safety glasses

B. Hand tool assortment

C. Parts brush

D. Solvent

E. Shop towel

F. Inside micrometer

G. Piece of paper

H. Appropriate service manual

II. Procedure

(NOTE: Always put on safety glasses before starting a project.)

A. Disconnect spark plug wire and ground it to the block

B. Secure appropriate service manual

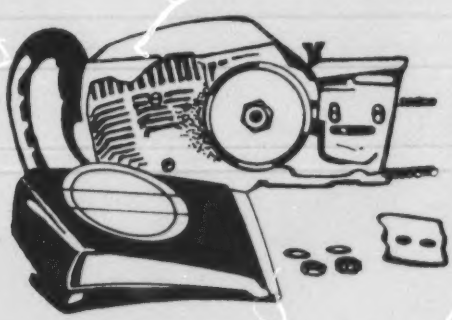
C. Place saw in convenient position for this job

D. Remove chain and bar

1. Remove bar mounting nuts and washers

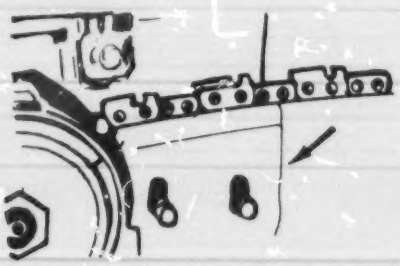
2. Remove outer cover (Figure 1)

FIGURE 1



(NOTE: If guide bar plates are used, note their position for replacement. See Figure 2)

FIGURE 2



3. Slide bar back towards clutch

   (NOTE: This will loosen the chain for easy removal. If a screw tensioner is on the saw, loosen it to slide the bar back.)

4. Remove the chain

   (NOTE: It would be a good idea to soak the chain in oil while repairs are being made.)

5. Lift the bar from the saw

   (NOTE: Keep all parts together for replacement. Don't leave the saw where it could be knocked off a table and damaged.)

E. Remove direct drive assembly

   (NOTE: Brush all parts clean before starting.)

   1. Remove clutch hub and key from shaft

      (NOTE: On some models this requires the removal of a retaining nut, and on some models the hub screws on with left hand threads to the crankshaft. Do not remove the drum with the hub.)

   2. Remove clutch drum

      (NOTE: For sleeve bearing and needle bearings with races just pull drum off shaft.)

      a. Cut a piece of paper roughly 2" x 3"

      b. Roll it into a sleeve

      c. Pull the drum off the shaft until roller bearings start showing over crankshaft taper

      d. Insert paper roll inside bearings

      e. Pull drum slowly off while pushing paper forward to hold bearings

JOB SHEET #1

F. Inspect parts

1. Clutch shoes

a. Check for even wear

b. Check for breaks

(NOTE: Replace shoes if clutch had been slipping or if any shoes are broken or damaged.)

2. Clutch springs

a. Check for breaks or stretched springs

(NOTE: It is usually best to replace all springs if one is bad and more than one is used.)

b. Replace springs if clutch was not disengaging or if damaged or stretched

3. Clutch drum

a. Inspect sprocket

(NOTE: Integral star and self aligning should both be replaced if grooved or damaged.)

b. Inspect shoe surface of drum

(NOTE: Replace if scarred or pitted.)

4. Bearings

a. Measure inside surface on sleeve bearings

(NOTE: Discard if manufacturer's specifications are not met or if bearing is scarred or damaged.)

b. Replace roller bearings if damaged or if space exists for the insertion of one or more rollers

5. Crankshaft--Inspect for wear or bearing surface damage

G. Replace all damaged or worn parts

H. Reassemble drive

(NOTE: Reverse disassembly procedures.)

I. Put on bar and chain

J. Adjust chain tension

JOB SHEET #1

K. Replace all housings and covers

L. Replace plug wire

M. Have instructor inspect work

N. Start saw and check operation

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NAME _____

TEST

1. Match the terms on the right to the correct definitions.

_____a. Device which the cutter chain drive links ride on or in as the drive assembly transfers crankshaft power to the chain

_____b. Power transfer assembly which uses centrifugal force to engage shoes to a drum

_____c. Gear placed between driving and driven gears in a gear system to maintain direction of rotation of driving gear

_____d. Device used to reduce friction between moving parts

_____e. System of mated gears designed to reduce the output speed and increase the torque of the system before it is applied to work

_____f. System using clutch and sprocket assembly to transfer power from crankshaft to chain

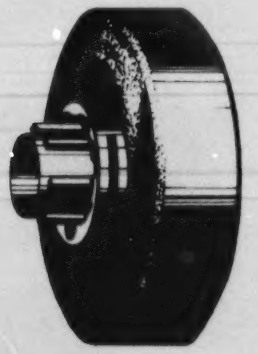
1. Bearing
2. Gear reduction
3. Sprocket
4. Idler gear
5. Centrifugal clutch
6. Direct drive

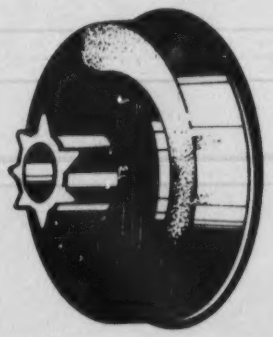
2. List two types of chain saw drives.

a.

b.

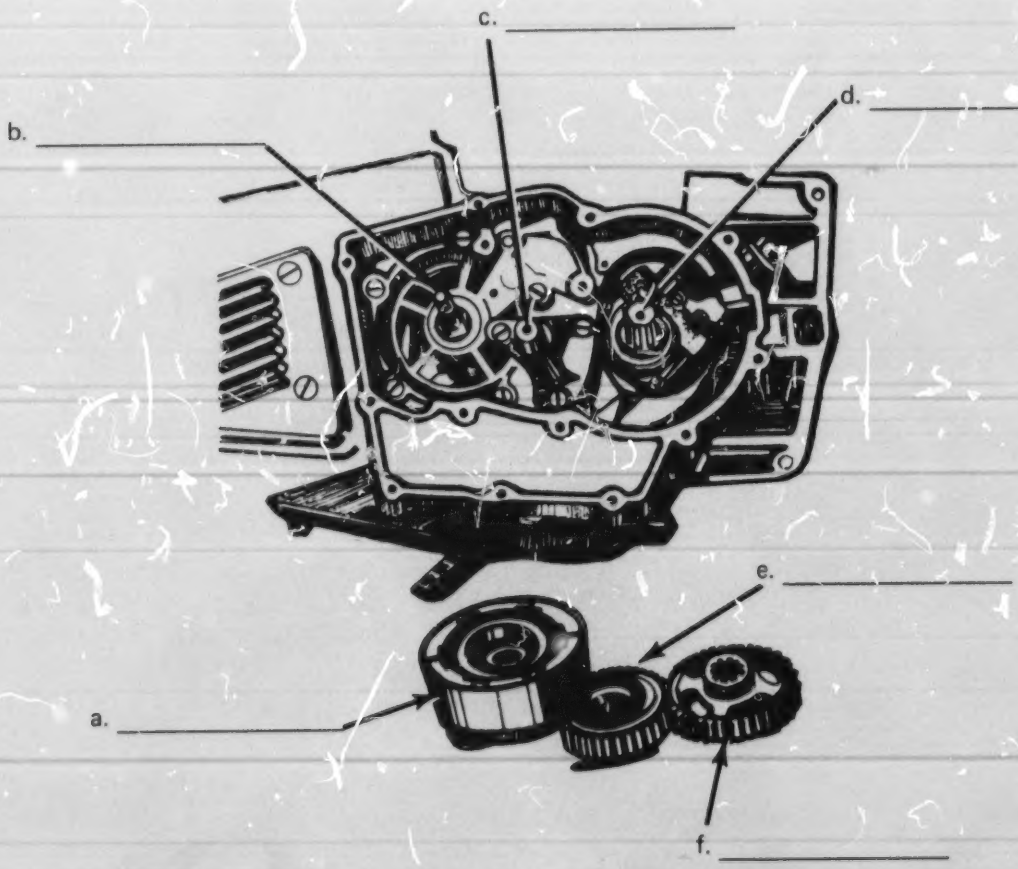
3. Identify the types of drive sprockets.



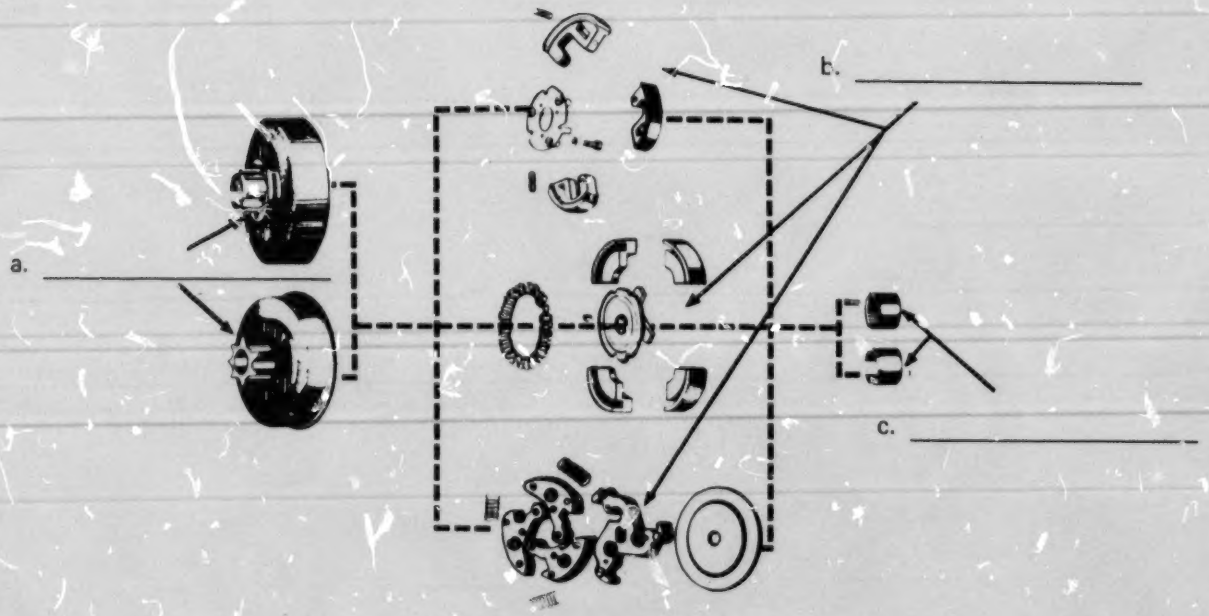


a. _____ b. _____

4. Identify the basic parts of a gear reduction assembly.



5. Identify the basic parts of a direct drive assembly.



6. Demonstrate the ability to remove, inspect, service, and replace a direct drive assembly.

   (NOTE: If this activity has not been accomplished prior to the test, ask your instructor when it should be completed.)

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ANSWERS TO TEST

1. a. 3
   b. 5
   c. 4
   d. 1
   e. 2
   f. 6
2. a. Direct
   b. Gear reduction
3. a. Self aligning
   b. Integral star sprocket and clutch drum
4. a. Clutch assembly with drive gear
   b. Crankshaft
   c. Idler gear post
   d. Oil pump drive and sprocket gear shaft
   e. Idler gear assembly
   f. Sprocket gear
5. a. Clutch drum or cup
   b. Clutch assembly
   c. Bearings
6. Performance skill evaluated to the satisfaction of the instructor